INFLUENCE OF LIFESTYLE CHOICES AND RISK BEHAVIOURS FOR OBESITY AMONG YOUNG ADULT WOMEN IN THE UNITED ARAB EMIRATES UNIVERSITY: A CROSS-SECTIONAL SURVEY

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Dedication

This thesis is dedicated to the Almighty God, my Lord and the Holy Spirit for His goodness and for His wonderful works in my life who enabled the completion of this thesis.

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Abstract

The impact of a rapid economic growth on the patterns and trends of overweight and obesity is profound. Obesity is closely linked to lifestyle choices and the risk behaviours that lead to obesity-related morbidities in young adults can be traced to the acceptable norms from childhood through to adulthood. The aims of this study were to estimate the prevalence of overweight and obesity using the World Health Organization classification and to investigate the influence of perceptions/beliefs and health-risk behaviours and their association with overweight and obesity among female university students of the United Arab Emirates University. A cross-sectional survey of the lifestyle choices, risk behaviours and perceptions of obesity with the Body Mass Index (BMI) status of 321 young adult women aged 18-30 years was conducted using a self-administered questionnaire. The female students responded to questions about their diet and physical activity patterns. They reported their height/weight, and weight-related measurements were taken to calculate the BMI. Overall, 20.2% of the students were overweight while 8.40% were obese. The likelihood of being overweight or obese was higher among students who were older, married and had a family history of obesity. Faculty of study (p=0.018) was significantly associated with prevalence of overweight and obesity. Many of the students did not consume fruits and vegetables or eat breakfast daily. Students who spent long hours on sedentary activities were more likely to be obese, with lack of time reported as a major reason for physical inactivity. Respondents wanted to lose weight most commonly for better health and well-being and because of problems with clothes sizes. In view of the high number of health risk behaviours and prevalence of overweight and obesity, prompt action is needed to initiate and sustain interventions and preventive measures that could change the health-compromising behaviours associated with excess weight.

Keywords: lifestyle choices; risk behaviours; BMI; overweight; obesity; UAE

Glossary of terms

Behaviour – The manner of an acceptable action or reaction of a person or group of people to their environment.

Belief - An acceptance that a statement is true.

Body Mass Index (BMI) - The body mass index (BMI) is an individual's weight in kilograms (kg) divided by their [height in metres (m)] ^{2}.

Environment - The circumstances or conditions that surround people or individuals.

Epidemic – Disease spreading rapidly and extensively by affecting many individuals in an area or a population at the same time.

Health risk factor - Something that increases a person's chances of developing a disease

Lifestyle - a way of life or style of living that reflects the attitudes and values of a person or group of people.

Overweight - Overweight is having excessive body fat than is optimally healthy with a BMI $\geq 25 kg/m^2$.

Obesity - The state of being well above one's normal weight with a BMI $\geq 30 kg/m^2$

'Obesogenic' environment – "The sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations" (Swinburn et al., 1999).

Perception - The process by which humans acquire, interpret, select and organize sensation to produce knowledge, attitudes, beliefs and values that affect their health behaviour and lifestyle choices.

Prevalence – The number of cases of a specific disease present in a given population at a certain time.

Socioeconomic status – the position of an individual on a social-economic scale that measures such factors as education, income, type of occupation, place of residence, and, in some populations heritage and religion.

Abbreviations

ANGELO – (ANalysis Grid for Environments Linked to Obesity)

BMI – body mass index

BMR – basal metabolic rate

CI – confidence interval

cm – centimetre

DR-NCD – diet-related non-communicable diseases

EAT-26 – Eating Attitudes Test 26 – item version

FM – fat mass

FFM – free fat mass

FRS – figure rating scale

GSHS – UAE Global school-based student health survey

IOTF – International Obesity Taskforce

kg – kilogram

MOH – Ministry of Health

m – metre

n – number

NR-NCD – nutrition-related non-communicable diseases

OR – odds ratio

% – percentage

PA – physical activity

PAC – physical activity questionnaire

PALs – physical activity levels

PASW – Predictive Analytics Software (applied statistical software)

R – Pearson correlation coefficient

SES – socio-economic status

SD – standard deviation

SPSS – Statistical Package for Social Sciences

TBW – total body water

UAE – United Arab Emirates

UAEU – United Arab Emirates University

UC – University of Canterbury, New Zealand

WHO – World Health Organisation

WWW – (World Wide Web) Used to refer to that part of the Internet that contains searchable information.

1 Introduction

1.1 Overview

Overweight and obesity is a significant public health issue in United Arab Emirates (UAE) and the rest of the world. The purpose of this thesis is to estimate the prevalence of overweight and obesity and its known risk factors among young female adult students in the United Arab Emirates University (UAEU). Another objective is to estimate the self image and opinions about overweight and obesity in that population.

Obesity is a preventable risk factor for many chronic diseases including type 2 diabetes, cardiovascular diseases, various forms of cancer and depression (Harrington & Elliot, 2009). Overweight and obesity are associated with diabetes, high blood pressure, high levels of cholesterol, asthma, arthritis and poor health status (Mokdad et al., 2003). The primary cause of obesity is known to be the imbalance between the energy intake from food and energy expenditure in activity while the secondary or indirect causes include social, cultural and economic circumstances surrounding eating and activity patterns (Kedgley, 2007). Both developed and developing countries are experiencing an increase in the incidence and prevalence of type 2 diabetes and different obesity-associated diseases due to an evolving 'obesogenic' lifestyle and environment (Swinburn et al., 1999).

About four decades ago, UAE was a relatively poor country with lack of necessary infrastructure and amenities (for example, electricity, water supply, sewage disposal, availability of hospitals, and modern schools). However, following the discovery of oil and a resulting economic boom, the influx of Western companies has impacted on the traditional way of living. Thus market globalisation, industrialisation, urbanisation and the development of the economy due to oil has resulted in rapid shift in diet and lifestyle patterns. These changes are believed to be connected to the emergence of diet-related non-communicable diseases (NCDs) such as obesity, diabetes, cancer and hypertension (Popkin, 2001).

According to Swinburn et al. (1999), an 'obesogenic' environment is characterised by the interaction of physical, economic, political and socio-cultural influences. Swinburn defined 'obesogenicity' of an environment as 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations'.

These conditions, according to Mpofu (1994), might be due to spreading urbanisation and industrialisation in societies such as the United Arab Emirates. Studies have shown that greater body weight (higher BMI) increases the risk of death from any cause and death from cardiovascular diseases in men and women (Lavie et al., 2009; Must et al., 1999). A cohort study in the United States of America of 2,506 women and 2,860 men in the Lipids Research Clinics Study shows that among men and women greater body weight increases the risk of death (Stevens et al., 2002). The relative risk associated with excess weight was higher among younger subjects in the study (Stevens et al., 2002). In order to develop prevention and intervention plans, it is necessary to be aware of the causes and consequences of overweight and obesity.

1.2 Causes and consequences of obesity

The aetiology of overweight and obesity is multifaceted, although a lack of energy balance is most often the primary cause. The imbalance of energy-in and energy-out could lead to either weight gain or weight loss with more energy-in than energy-out over time resulting in weight gain. Being overweight and obese is known to be major risk factors for chronic disabling diseases such as type II diabetes mellitus, cardiovascular diseases and cancer (WHO, 2010b).

Risk factors for overweight and obesity include; genetic factors, age, race, lack of physical activity, excessive eating or energy intake, medications, pregnancy, sleep deprivation, emotional and/or psychological factors such as depression and stress all have been shown to be significant risk factors (Musaiger, 1998; Pouliou & Elliot, 2010). Lack of knowledge and inappropriate information about the benefits of exercise and healthy diet are contributing factors for obesity.

Other conditions associated with obesity include hypothyroidism; Cushing's syndrome and polycystic ovarian syndrome (PCOS) have been associated with the development of obesity (Aronne, 2002). In terms of consequences, obesity has been associated with several medical conditions including type II diabetes, coronary heart disease, hypertension, stroke, sleep apnoea, osteoarthritis, gallstones, cancer of the colon, rectum and prostate as well as psychological disorders and social withdrawals due to lack of self-esteem and discrimination (Aronne, 2002; Berger & Peerson, 2009; Carter et al., 2004; Henry et al., 2004; Musaiger, 1998)

1.3 Classifications of overweight and obesity

Overweight and obesity are measured internationally using the Body Mass Index (BMI). This is calculated by dividing the weight in kilograms (kg) by height squared in metres (m^2). According to the WHO, individuals with BMI (kg/m^2) 18.50 – 24.99 are within the normal range; those with BMI (kg/m^2) 25.00 – 29.99 are pre-obese; BMI (kg/m^2) 30.00 – 34.99 are known as obese class I; BMI (kg/m^2) 35 – 39.99 are obese class II and BMI (kg/m^2) $\geq$ 40 are classified as obese class III (WHO, 2006).

The number of people who are overweight or obese is increasing worldwide, with an estimated 1 billion adults classified as overweight (body mass index [BMI] $\geq$ $25kg/m^2$) by the World Health Organization (WHO, 2010a) and about 300 million of these individuals are estimated to be obese [BMI $\geq$ 30 kg/m^2] (IOT, 2010).

Although obesity is known to be associated with the genetic make-up of an individual, the interactions between the environments and an individual is an important process of reciprocity that needs adequate consideration' (Pearce and Witten, 2010) owing to its economic and adverse psychosocial consequences (Harrington & Elliot, 2009).

1.4 Overweight and obesity in the United Arab Emirates

The United Arab Emirates (UAE), an Arabian Gulf country, has been reported to have experienced a rapid rise in the incidence and prevalence of obesity and diabetes. These major health problems have occurred in the past four decades because of the economic boom arising from the discovery of oil (Abduelkarem, 2005; Al Hourani et al., 2003; Carter et al., 2004; Mahdi & Abdel Razig, 2008; Mpofu, 1994; WHO, 2010c; Zaal et al., 2009).

The surveillance of chronic health conditions such as obesity (Williamson, 2000) would be an important step towards its prevention and control in the UAE. This thesis research estimates the risk of overweight and obesity among young female adult students at the United Arab Emirates University (UAEU). In this research, the prevalence of risk behaviours such as diet,

sedentary lifestyle, as well as the prevalence and knowledge, perceptions and beliefs about overweight and obesity in this micro-environmental sector (UAEU) are investigated. For the purpose of this research, young adults are considered as aged 18–25 years of age.

Economic boom

In the UAE, there have been rapid changes in attitude and lifestyle brought about by the economic boom. According to Thomas et al. (2010), the transition 'from relative poverty (no electricity, plumbing, modern schools or hospitals) to the world's fourth largest oil producer and richest state per head of population' has had profound impact on the nation's economy. Factors such as globalisation, acculturation (influence of western cultures) and the economic boom have led to socio-cultural influence on the traditional way of living that involved more physical activities (Thomas et al., 2010). This change in the environment therefore results in greater reliance on convenient fast foods and lack of fruit and vegetable consumption which is known to contribute to overweight and obesity (Zaal et al., 2009).

Thomas et al. (2010) have pointed out that another factor affecting UAE's nutrition transition is the global consumer culture. UAE as the most liberal country in the Gulf States has embraced Western influences, migration, tourism, foreign investments more than Gulf countries such as Saudi Arabia and Oman (Eapen et al., 2006; Thomas et al., 2010). The Abu Dhabi Department of Planning and Economy faces many problems in trying to move from the country from a highly consuming nation to a producing one (Thomas et al., 2010). Levels of illiteracy are higher among men (18.4%) than women (12.1%) in UAE. Increase in educational levels and change in roles of women have been considered as part of the shift from traditionalism to liberalisation. In UAE, education is free for male and female nationals up to graduate level. Many members of the university student population belong to wealthy, influential and high socio-economic status population groups (Thomas et al., 2010). The improved socio-economic status of many Emirati families has been associated with the rising level of obesity and increased sedentary lifestyle (Musaiger, 2004; Zaal, 2009).

Lifestyle choices of dietary and physical activity patterns

The choice of diet and dietary and physical activity habits has been found to have significant impact on the nutritional status of the UAE population at large. Reports have also shown a pattern of eating that are moved towards fast food and fatty foods as well as frequent snacking between meals (Eapen et al., 2006; Musaiger, 1998; Musaiger, 2002; Musaiger & Radwan, 1995; Musaiger et al., 2000). The practice of skipping breakfast among women is reported to create a tendency for overeating during lunch or dinner (Zaal, 2009). High consumption of energy-dense foods such as some types of bread, burgers, cheese and carbonated canned drinks during the day and in the night (most families stay up late) is known as a contributory factor for weight gain (Zaal, 2009). Among UAE families, the habit of eating meals in front of the television is very popular as well as frequent snacking among adolescents (Zaal, 2009). Chocolates, sweets and dates are frequently consumed with every meal, along with consumption of canned fruits instead of fresh fruits and vegetables.

There has been some documentation of the evidence of lack of physical activity in the UAE that has been linked to overweight and obesity (Berger & Peerson 2009; Carter et al., 2004; Henry et al., 2004; Musaiger, 1998). Berger and Peerson (2009) reported that there are few studies available on physical activity among UAE women. Their qualitative study indicated that UAE college women have not developed healthy adult lifestyles that include regular exercise due to various barriers such as lack of female role models, social support, time, transportation, finance, social norms and information on benefits (Ali et al., 2010; Berger & Peerson 2009). The lack of incorporation of physical activity into the social environment of schools, family, and friends is due to the low value placed on exercise both in the community and among physical education teachers (Berger & Peerson 2009).

According to Amine and Samy (1996), the conservative society of the UAE makes it unacceptable for females to participate in sports or other physical activities outdoors thereby restricting the amount of physical exercise undertaken by women. The UAE is an arid and desert region with two distinct seasons: a hot summer between April and September, with temperatures exceeding 50°C, and a milder winter between October and March (Henry et al., 2004). Consequently, between 13:00–16:30 hours shops are closed and the time is often spent sleeping (Henry et al., 2004).

In addition, studies have shown prevalence of overweight and obesity (Al-Hourani et al., 2003; Kerkadi et al., 2005; Malik & Bakir, 2007; Sheikh-Ismail et al., 2009) and some research has indicated that known risk factors for overweight and obesity are on the increase in United Arab Emirates (Musaiger & Radwan, 1995; Musaiger et al., 2003; Musaiger & Abuirmeileh, 1998; Musaiger et al., 2000; Zaal et al., 2009). Nevertheless, there is need for more education by health professionals as well as research into effective interventions on health awareness and education for the population.

Body image perceptions and beliefs about obesity

A few studies have described attitudes and body image concerns among females in the UAE (Eapen et al., 2006; Musaiger, 1994; Thomas et al., 2010). Questions about the importance of body image perception and the beliefs about obesity among adolescents and young adults in UAE have been raised. These have been found to be associated with overweight and obesity (Eapen et al., 2006; Musaiger, 1994; Thomas et al., 2010; Trainer, 2010). In 1994, Musaiger reported that a high percentage of UAE university females did not know their weights and heights while about 50% of the women did not know the complications of obesity (Musaiger, 1994). This suggests that at that time attitudes and knowledge of these female UAE university students on obesity were poor (Musaiger, 1994). Furthermore, there have been indications of disordered eating being the result of conflicts between traditional lifestyle and liberalisation in UAE (Eapen et al., 2006). Thomas et al. (2010) reported that one quarter of the 228 sample (of Zayed University female students in UAE) for an Eating Attitude Test 26-item version (EAT-26) study held abnormal eating attitudes. A total of 78% were dissatisfied with their current shape. Similarly, eating disorder has been reported to be positively correlated with body image dissatisfaction in Zayed University female students (Thomas et al., 2010).

1.5 Background to the United Arab Emirates health system

The United Arab Emirates (UAE) is situated in the Southeast of the Arabian Peninsula located in the Southwest Asia. The United Arab Emirates (UAE) shares borders with Oman, Kingdom of Saudi Arabia, Qatar and also marine boundaries with Kuwait, Iran, Iraq and Bahrain. UAE consists of seven Emirates namely, Abu Dhabi, Dubai, Sharjah, Ajman, Umm

al-Quwain, Fujairah and Ras al-Khaimah. Abu Dhabi is the capital of UAE and the largest of the seven Emirates. Arabic is the official language and Islam is the official religion in UAE. Furthermore, the UAE is classified as a high-income developing economy by the International Monetary Fund (IMF).

The UAE health system consists of three main authorities: the Federal government Ministry of Health (MOH), Health Authority of Abu Dhabi (HAAD) and Dubai Health Authority (DHA). In 1970, the Department of Health and Medical Services (DOHMS) of Dubai was established as a local health authority and service provider for the population of the Dubai emirate. DOHMS continued to be the main local health authority in Dubai even after the formation of the MOH. In 2006, the Government of Abu Dhabi re-organized its health system and introduced a private health insurance and private provision model. The health authority adopted a strategic and regulatory role, and a separate health services company (SEHA) was established to operate government owned healthcare facilities (Sharif & Blair, 2011). Dubai Health Authority (DHA) was formed in 2007, to oversee health strategy and regulation when it was separated from health service provision.

The MOH federal authority provides the public healthcare facilities and services in the Emirates of Ajman, Sharjah and the rest of the northern Emirates. It sets health strategies and policies for the nation as well as health promotion programs such as the National Immunization Program. The MOH is responsible for financing the health care system. The HAAD regulates the health industry and sets the health policy and strategy of the Emirate of Abu Dhabi. The Abu Dhabi Health Services Company (SEHA) manages the government owned healthcare facilities in the Abu Dhabi Emirate while the DHA regulates the health care system in the Emirate of Dubai (MOH, 2011). The DHA has a strategic and regulatory role similar to HAAD, but it still operates its own hospitals and health centres. Dubai Healthcare City, a free zone entity, has been developed to encourage medical tourism in UAE (Sharif & Blair, 2011).

According to Sharif & Blair (2011), in Dubai and Abu Dhabi the MOH role is now focused on developing national health strategy and policy but it still has a role in provision of health services in the five remaining emirates. The UAE nationals have free access to public sector healthcare services in Dubai and in the northern emirates while in Abu Dhabi they are

covered by a government-funded health insurance scheme that allows them to choose from different private providers (Sharif & Blair, 2011).

Figure 1: Map of United Arab Emirates (UAE)

According to Kronfol (1999), the UAE was reported to have one of the highest ratios of beds per population in the world in its health institutions such as hospitals, clinics and health centres. Health care is also relatively free (employers are required to provide medical insurance for all their employees) to both nationals and expatriates with health insurance. The quality of facilities and services varies between the different emirates and service providers and morbidity is more amongst nationals than non-nationals (Sharif & Blair, 2011). The Dubai government also has plans to expand private sector services, social health insurance as well as the number of beds and facilities within the Dubai Health Care City (DHCC).

1.6 An overview of actions to alleviate overweight and obesity in UAE

Since 2007, UAE government has tried to prevent, and manage overweight and obesity using treatment, regulation and education. The UAE started to address the high rates of overweight and obesity through educational campaigns, seminars, and conferences. The World Health Organisation and Sanofis-aventis Pharmaceutical company sponsored free health screenings and awareness campaigns to educate the people of UAE about the causes and consequences of obesity and diabetes (MOH, 2011a). The campaign was initiated in response to the International Day for Evaluation of Abdominal Obesity survey (IDEA), which reported that 37% of adults aged thirty and above were obese (using the waist circumference measurement) in UAE (Balkau et al., 2007). For the 2007-2008 academic year, the MOH designed a school program that was targeted at teenagers and their health. The awareness and education program included important topics such as personal hygiene, smoking, physical exercise (e.g. playing sports) and obesity (MOH, 2011b). In the bid to improve health awareness, obesity and diabetes clinics have been established in Abu Dhabi and Dubai to help improve diagnostic techniques in order to offer long term solutions to obesity and weight management problems in the region.

In 2009, the MOH drafted a set of nutritional guidelines, based on WHO recommendations, for the management of non-communicable diseases with a main goal of improving the population's well-being (MOH, 2011c). Nutrition education programs were set up in health centres, schools, and women's associations to spread awareness of and to prevent non-communicable diseases. The draft included ways of improving the methods of food preparation in school canteens, homes and hospitals as part of the National Nutritional Strategy and Action Plan for 2010–2015 (MOH, 2011c).

The National Nutrition Committee was founded with the purpose of creating a national strategy (Reid, 2010). In 2010, the National Nutrition Strategy was announced, designed to enable citizens of UAE to have a healthier future. The Strategy outlined how this goal would

be achieved through early nutritional intervention programs and the importance of healthy foods and exercise in schools, homes and workplaces (MOH, 2011d).

The General Administration of Youth Centres and the Department of Health Education and Promotion sponsored a camp in July 2010 that involved a selected 20 obese teenagers. During the camp, every participant was encouraged to lose one kilogram a week with medical check-ups and relevant tests conducted at the beginning and end of the session. The teenagers were given lectures on healthy food consumption, participated in daily sports activities and also practised eating healthy meals and snacks (MOH, 2011e). The Ministry of Health conducted an awareness campaign called "Summer in My Country" which consisted of a series of lectures aimed at teenagers and covered topics such as smoking, obesity, and losing weight (MOH, 2011e). The Abu Dhabi Food Control Authority addressed the rising rates of obesity by banning some junk foods from school canteens. This included burgers, sharwarma, sugary drinks, and energy drinks. Parents were equally supportive of the decision.

The Rashid Centre for Diabetes and Research was reported to have provided treatment for 650 cases and received 4000 visits in five months (MOH, 2011f). A new WHO collaborating centre was inaugurated at the UAEU Department of Nutrition and Health. Lately some walking paths have been built, buses have been made available to commuters (mainly used by low SES manual workers) and there have been efforts to keep the parks green though the few parks are not often used during the summer (the longer and lengthy season in UAE). There have been calls for marathons; however, they are most often not well attended. However, these initiatives are a good start but more action is needed to attain the goal of improving well-being for all the population.

1.7 Research aims and objectives

1.7.1 Purpose

The purpose of this study is to estimate the prevalence of known risk factors, risk behaviours, and lifestyle choices for being overweight or obese among female university students at the

United Arab Emirate University (UAEU) and to examine the dietary habits and physical activity among the same group with a view to recommending interventions.

1.7.2 Research question

What is the prevalence of overweight/obesity and lifestyle variables and known risk behaviours for being overweight and obese among 18–30 years old female university students at United Arab Emirate University (UAEU)? To what extent are the lifestyle choices and risk behaviours that contribute to overweight and obesity present among young female adults at UAEU?

1.7.3 Research aims and objectives

The research aims and objectives were refined as below:

- To estimate and describe the prevalence of overweight and obesity among female university students in the United Arab Emirates University (UAEU).
- To estimate and describe the prevalence of four lifestyle risk behaviours (dietary habits of food consumption, physical activity, sedentary behaviour, and perceptions and beliefs about obesity) of overweight and obesity among female university students in UAEU.
- To examine the relationships between socio-demographic, behavioural and psychosocial lifestyle factors with overweight and obesity.

1.8 Thesis structure

This thesis consists of five chapters. Chapter one, the introduction, is a concise presentation of the research problem and the aims and objectives. The literature review (chapter two) gives a theoretical base and evidence to support the research. Chapter three reports on the hypotheses and research methods and materials used to conduct this study. Chapter four sets out the results of the findings of the frequencies of occurrence and it contains the results of

the cross-tabulations used to determine associations between the variables of the study. Discussion of the findings is presented in chapter five which makes links between the aim of the study and its findings within the context of the literature. This chapter also draws all arguments and findings together and provides some indications for future research and actions with a final conclusion.

2 Factors influencing overweight and obesity in populations

2.1 Introduction

Studies of the risk behaviours and lifestyle circumstances that lead to overweight have identified unhealthy dietary patterns, sedentary lifestyles, education, socio-economic factors, perceptions and beliefs about overweight and obesity as key elements of concern for public health and well-being. A study by Popkin and Gordon-Larsen (2004) indicated that behavioural change is an efficient way of reducing diet-related non-communicable diseases (DR-NCD) and a great intervention tool for improving and prolonging good health, and reduce aging in the society. Much of the research, however, has taken place in western countries but, given the importance of cultural influences on lifestyle and behaviour (Popkin, 2001), specific research is required for cultural situations in non-western and developing countries, such as the UAE.

Over the last few decades developing countries in the Middle East have experienced a significant shift in diet (nutritional transition) and physical activity patterns due to economic development. Modernization, characterised by nutritional transition to high fat and high carbohydrate dietary intake (so called 'western diet') and low physical activity levels has led to a lifestyle that can result in chronic conditions and degenerative diseases such as obesity, diabetes and hypertension (Popkin, 1999; Popkin, 2001; Popkin & Gordon-Larsen, 2004). Effective and efficient management of overweight and obesity therefore requires a move towards changes in erroneous perceptions and beliefs about obesity, unhealthy diets and sedentary lifestyles.

A literature review was carried out using the PubMed Central, Medline database, WHO Infobase and Google Scholar to search for relevant search terms such as "overweight" AND "obesity" AND "UAE" AND "lifestyle" AND "risk factors" to obtain bibliographies of the literature from the original searches. The literature review:

- Examined the evidence of twenty-one research studies of the risks associated with obesity in the UAE in the last fifteen years.
- Investigated theories and models from research from other countries in the last fifteen years.
- Looked into current state of research and identified gaps in the research.

Firstly, it is important to look into some important approaches that contribute to understanding the growing overweight and obesity epidemic.

2.2 Conceptual frameworks and approaches to understanding overweight and obesity

2.2.1 Life course perspectives on overweight and obesity

In order to have an in-depth understanding of a chronic condition and debilitating disease such as obesity, it is crucial to understand the established conceptual frameworks for analysing these types of diseases. The life course analysis model of health and diseases shows that 'the risks of physical and social exposure to the environment during gestation, childhood, adolescence, young adulthood and later adult life' determine the course of a chronic disease (Ben-Shlomo & Kuh, 2002). These risks as defined by Ben-Shlomo & Kuh (2002) include 'studies of biological, behavioural and psychosocial pathways that operate across an individual's life course as well as across generations, to influence the development of chronic diseases.' It was also reported in the study that 'sources of risk to adult health lay in early life' (Ben-Shlomo & Kuh, 2002).

Research in the United States shows that BMI increases with age and that childhood obesity persists through to adulthood (Lee et al., 2010). A recent birth cohort study of participants in the NHANES Surveys (1971-2006) by Lee et al. (2010) indicated that weight gain accumulated over time leads to lower quality of life, a decrease in life expectancy and premature mortality in the US population. Darnton-Hill et al. (2004) suggested that the life course processes and associated environmental and societal influences that cause the risks of chronic diseases to develop and progress throughout the life course can be divided into five stages: i) foetal life development ii) infancy or childhood iii) adolescence iv) adulthood and v) aged people. It is evident that to improve the quality of life holistically, it is important to address risk factors for overweight and obesity throughout the life course (Darnton-Hill et al., 2004). For example, it has been reported that increased birth weight increases the risks of obesity later in life (Darnton-Hill et al., 2004). Accumulated risks of overweight and obesity produce established behavioural and biological risk factors in adult life (Darnton-Hill et al.,

2004). These risk factors have been brought about by the social and economic changes that resulted in changes in the dietary and physical activity patterns.

Changes in exercise patterns and unhealthy lifestyles, such as family eating patterns, are confirmed as the most significant risk factors/behaviours for overweight and obesity. Kabir (2005) suggested that sudden changes in lifestyle due to affluence, change in socio-economic status and urbanisation have led to the emergence of altered nutrition and physical activity levels in the developing countries. The major biological risk factors are known to emerge at infancy and continue to have a negative impact on later life, and throughout the life course (Darnton-Hill et al., 2004).

2.2.2 ANGELO (ANalysis Grid for Environments Linked to Obesity) framework

Another very important and widely established approach is the ANGELO (ANalysis Grid for Environments Linked to Obesity) framework. The ANGELO framework indicates the significance of the physical, economic, political, and socio-cultural settings of an environment in combating overweight and obesity (Swinburn et al., 1999). The authors argue that educational, behavioural and pharmacological approaches to reduce the obesity epidemic are necessary but not sufficient because of the way in which local environments promote high energy intake and sedentary behaviours. The physical settings of the environment can be referred to as the accessibility and availability of choices of healthy or unhealthy foods and whether or not an environment supports physical activity. The economic environment pertains to the costs or financial factors of healthy or unhealthy foods and the option of physical activity. The political environment refers to the rules and regulations guiding the type of foods available for consumption as well as a restricted sedentary lifestyle in the environment. In addition, the socio-cultural environment comprises the social and cultural norms and values of society, including family influences, peer pressure and perceptions and beliefs about overweight and obesity (van der Horst et al., 2007).

Until recently, research on determinants of dietary intake in children and adolescents has focused on individual level of determinants such as taste preference, attitudes, social influence and perceived behavioural control of appetite (van der Horst et al., 2007). A focus on environmental determinants, however, is encouraged due to its cost-effectiveness and the ability for it to change socio-cultural norms, policies, systems and structures (Swinburn et al.,

1999). Both population-based approaches (Kumanyika et al., 2008) and community-based interventions for obesity prevention using the ANGELO framework are important components of overweight and obesity management (Simmons et al., 2009). Studies have used a variety of methods to report that the body weight of an individual changes as food and the activity environment changes (Musaiger, 2004; Popkin et al., 2001). This has been observed in many countries as they transform into industrialized and modernized cultures, and as people migrate within and between countries (Fairburn & Brownell, 2002). For example, it has been noted that the movement of individuals from rural villages into towns and cities leads to them becoming obese as a result of the change in lifestyle (Fairburn & Brownell, 2002; Galal, 2002; Ghaseemi et al., 2002; Rigby et al., 2009).

As overweight and obesity have been associated with increased morbidity and mortality, it is important to be able to estimate accurately the extent of overweight and obesity among people and populations with known risks factors (Mascie-Taylor & Goto, 2007). It is therefore an issue of concern that needs to be addressed, as evidence continues to show that weight loss reduces the risk for developing diabetes or cardiac problems (Mokdad et al., 2003).

2.2.3 Social determinants of health

The social determinants of health are the social and economic conditions in which people are born, grow, live, work and age, including access to health care (WHO, 2011). These conditions are determined by the distribution of money, resources and power at the global, national and local levels, which are influenced by the policy choices of a society (WHO, 2011). Key determinants of health in a society therefore include; the income and social status; social support networks; education and literacy; employment conditions; social and physical environments; personal health practices; genetic endowment; health services; gender and culture. According to Reidpath et al. (2002), studies have focused on socioeconomic status (SES) as the main determinant of obesity, finding a negative association between obesity and SES. That is, as SES decreases the risk of obesity increases. A reliable method of measuring overweight and obesity that can be applied in various countries is therefore necessary, with the Body Mass Index (BMI) the most accepted internationally (Duncan et al., 2009).

2.3 Measurement of obesity: BMI

Despite some debate, the BMI as an index of weight-for-height to classify into underweight, normal, overweight and obese adults is the most acceptable and universal method of measuring overweight and obesity (Duncan et al., 2009). BMI (kg/m^2) is defined as weight (kg) divided by height squared (m^2). It is recommended by the WHO as an acceptable standard of measurement and it is an inexpensive method for assessing body fat in large epidemiological studies (Lee et al., 2010). However, some studies have argued against its reliability, as it is based on weight and height alone (Frankenfield et al., 2001; Mascie-Taylor & Goto, 2007; Rush et al., 2003). A drawback or limitation of BMI is known to be in its estimation of body fat. Other types of obesity measures are bio-impedance analysis (BIA), fat mass (FM), and body adiposity index (BAI). Frankenfield et al. (2001) indicated that there was variability in predicting the percentage of body fat, especially at a BMI below $30kg/m^2$. People with BMI below $30kg/m^2$ were found to be misclassified by BMI where impedance-derived body-fat mass was used as the criterion (Frankenfield et al., 2001). According to Mascie-Taylor & Goto (2007), using the universal BMI cut-off points does not seem appropriate for large populations given that there are variations between ethnicities, and that urban rates of obesity are higher than those in rural areas. Given the differences across ethnicities, lowering the BMI cut-off for some populations would be beneficial in Asian countries for a standard population-based measure of overweight and obesity status.

BMI is highly age-dependent and it is more difficult to define in children (Rush et al., 2003). A study of the effect of age on the association between BMI and mortality in United States indicated that excessive body weight gain between 30 and 74 years of age increases the risk of death from any cause and from cardiovascular disease in adults. The study found that 'relative risk associated with greater body weight is higher among younger subjects' in the age group (Stevens et al., 1998). The WHO BMI database for adults shows that there are gender differences in the BMI of a population. It was noted that, 'on average, women are more obese than men, while men are more likely to be pre-obese than women' (Mascie-Taylor & Goto, 2007). However, BMI is considered as an acceptable indicator of body composition because it is cost-effective and easy to measure. BMI as a measure of body fatness is considered to be quite a good indicator of excess energy as fat (Mascie-Taylor & Goto, 2007).

2.4 Overweight and obesity: the effects of the 'obesogenic' environment

This research focuses mainly on health risk factors and obesity related behaviours among young people, which are most often learned in childhood, an important public-health concern. Researchers have also reported that gaining weight in childhood and early adult life increase the risk of becoming diabetic or contracting cardiovascular diseases (Willett et al., 1995; Williams & Fruhbeck, 2009). According to Whitaker et al. (1997), childhood obesity increases the risk of becoming obese during adulthood. Whitaker et al. (1997) also argued that parental obesity is a factor for becoming obese in a child's young adult life, which results in increased morbidity and mortality among these young adults. Furthermore, as stated by Ebbeling et al. (2002), even though genetic predisposition to obesity can affect individuals the rising prevalence of obesity in genetically stable populations suggest that the environment is an important underlying factor. Ebbeling et al. (2002) indicated that an obesity-related health risk can differ substantially between ethnic groups as a result of cultural-specific factors that influence a community. To be able to modify or prevent obesity, it is essential to understand the factors that determine health behaviours so that eating patterns can be efficiently and effectively changed (van der Horst et al., 2007).

Recognizing the fact that dietary habits, behaviour and lifestyle are based on social contexts and practices (Pearce & Witten, 2010), the focus of research for the past 10 years has been on the food environment, dietary intake and physical activity (Boyland et al., 2008; Musaiger, 1987; Musaiger, 1993-94; Willett et al., 1995; Williams & Fruhbeck, 2009). Evidence of the varying interaction of obesity promoting factors in our political, economic, physical and social environments, and the daily routine practices of diet and physical activity have been documented (Pearce & Witten, 2010). The accelerating rate of obesity in non-Western countries has been associated with globalisation, with Western influences infiltrating the traditional lifestyle (Prentice, 2005). This is particularly evident in the 'comparisons of urban and rural diets' and physical activity patterns (Popkin, 1999). Examples of countries that have experienced nutrition transition and lifestyle change include China (Popkin, 1999; Popkin et al., 2001), India (Kabir, 2005; Popkin et al., 2001), Bahrain (Musaiger, 2000), Saudi Arabia (Musaiger, 1987; 2004), and the United Arab Emirates (Musaiger, 1987; Musaiger, 1993-94).

An 'obesogenic' environment which can include homes, schools, workplaces, community groups/places, media or university environments (Swinburn et al., 1999) can interfere with

the biological processes of body weight maintenance (Boyland et al., 2008). Characteristics of these environments include plenty of accessible, affordable and palatable foods that are highly promoted and advertised, as well as inactive lifestyles and the psychology of the preference for certain foods and food-seeking or feeding behaviours. According to van der Horst et al. (2007), an environment that encourages eating and discourages an active lifestyle is associated with increased obesity prevalence. The likelihood that an individual engages in healthy behaviour is higher when he/she is motivated to live a healthy lifestyle and has the ability to engage in the physical activities and opportunities that the environment has to offer (van der Horst et al., 2007).

In their research, Kim and Kawachi (2010) considered the linkage between neighbourhood socioeconomic environments, status and dietary intake, as well as sedentary lifestyle and physical activity and discussed the effect of the level of neighbourhood social capital on dietary intakes and physical activity. The investigators also explored the influence of the features of the built environment and urban sprawl on sedentary lifestyle and physical activity. The authors concluded from their studies that even though obesity is known to be hereditary the contributing contextual environmental factors are probably more important than genetics (Kim & Kawachi, 2010).

The aetiology of overweight and obesity is multi-factorial. The burden of obesity is therefore not only due to geographical differences but also involves socio-spatial differences that result in dietary and lifestyle choices (Pearce & Witten, 2010). Therefore, even though obesity has been related to heterogeneous conditions and termed ‘idiopathic’, (that is, arising spontaneously from an unknown cause) because of the lack of adequate investigative methodologies (Williams & Fruhbeck, 2009), it is a good idea to inquire into the homogenous environment for more contributory factors that support the spread of obesity. The influence of the environment on health risk behaviours is expansive in scope. However, there are few studies to justify which parts of the environment are more influential on lifestyle and risk behaviours in the Middle East (Musaiger, 2011).

2.5 Lifestyle issues and risk behaviours for overweight and obesity

Rapid shifts in the patterns of diet and physical activity have been the main cause of the recent increasing obesity rate in society. The impact of economic growth, urbanization and industrialization on the structure of diet and time to be physically active is profound. International trends show more consumption of foods prepared outside of the home; more processed and refined foods, more animal products and foods high in fat, and more milled and polished grains (e.g. rice, wheat) in urban areas (Badran & Laher, 2011; Popkin, 1999; Popkin and Gordon-Larsen, 2004). Time-allocation patterns have also changed significantly due to the growth of the service sectors at the expense of agricultural work (Popkin, 1999). Subsequently, economic changes have resulted in changes in women's roles and the distribution of labour (Popkin, 1999). High-energy expenditure jobs such as farming, mining, and forestry are being industrialized and as a result, creating more sedentary service jobs (Popkin and Gordon-Larsen, 2004).

Sanchez et al. (2007) reported that a study conducted in the US indicated that an estimated 55% of adolescents did not meet the physical activity guideline and 30% view television for more than two hours a day. Television watching (media, video games, movies and music) is said to be the dominant sedentary behaviour in adolescents. Adolescent boys were relatively more active with fewer sedentary behaviours than their girl counterparts.

The United Arab Emirates has experienced a changed nutritional status. This includes a recent shift to consumption of high-energy convenience foods and fast foods, the inaccessibility of fruit and vegetables and bigger portion sizes of meals (Zaal et al., 2009). According to Musaiger (2002), the Arabian Gulf Peninsula traditional diet pattern has been replaced with a Western-style diet characterised by high fat, free sugars, sodium, cholesterol and low fibre. Musaiger (2007) reported that skipping breakfast and unhealthy snacking habits between meals are eating practices that contribute to obesity and diabetes in UAE. Skipping breakfast is a dietary habit for weight control that tends to result in overeating due to the fact that it induces a heavier meal afterwards, that is, either lunch or dinner. Zaal et al. (2009) indicated the significant relationship between missing breakfast and female weight status. In their study, they found that, contrary to their expectations, fruit consumption was significantly associated with obesity in boys. Their findings also showed that the frequency of

fast food consumption was significantly related to the risk of obesity in girls. In a study conducted by Kerkadi (2003) at UAE University, 45% of the female students skipped breakfast and 34.9% consumed fast food at least once a week. The highest prevalence of overweight and obesity was found among students living in the hostels (Kerkadi, 2003).

A detailed understanding of factors (changes in lifestyle and socioeconomic status) that determine risk behaviours is important in order to modify and prevent overweight and obesity. Musaiger (2004) stated that with the availability of cars, an increase in technological home appliances and more involvement in office work, sedentary lifestyles have been on the increase. The pattern of active lifestyle has diminished steeply in most of the Gulf countries. In Egypt, exercising was the least noted activity among adults 20-70 years with only 2% reported as exercising during a typical day, 8.5% during weekends and 2.5% during annual leave. In Saudi Arabia, 53.5% of men aged 19 years and above were physically inactive and 27.5% irregularly active. It was also noted that physical activity was less amongst married people, the less educated, workers in the private sector, those working two shifts and those who had only one day off during the week (Musaiger, 2004).

In a cross-sectional survey of 300 male university students in the UAE, Musaiger et al. (2003) found that a family history of obesity, smoking and lack of physical activity are risk factors for obesity. Television watching was reported to occupy children, young adult and women's leisure time. It was suggested that watching television for a period of four hours or more per day was positively associated with obesity (Musaiger et al., 2003). In the profile report of Saudi men in Riyadh city, time constraint was reported as a major contributory factor for an inactive lifestyle while maintaining good health and losing weight were regarded as motivation for physical activity (Musaiger, 2004). From this research it can be concluded that motivation (in terms of time-allocation), a suitable enabling environment and an ability to engage in healthy behaviours are efficient drivers of a physically active lifestyle.

Musaiger (2004) also indicated that studies have shown obesity to be high among women with multiple pregnancies and high parity. In the Gulf region, the fertility rate of women is very high and the space between pregnancies is short. Food cravings and weight gain during pregnancy have resulted in accumulation of body fat ('baby fat') in women (Musaiger, 2004). Factors such as the environment at school and home, body image, beliefs and attitudes, lack

of health awareness, cultural conditions and stigma have been linked with obesity but have not yet been fully investigated (Musaiger, 2004).

2.5.1 Eating behaviours and patterns

Childhood patterning persists in eating behaviour

A systematic review of observational studies analysed by van der Horst et al. (2007) in the Netherlands indicated that individual level and environmental determinants of eating behaviours developed at an early stage in life will likely continue into adulthood, subject to the environmental factors involved. Parents are considered to play a big role in shaping a child or adolescent's healthful behaviours since they are considered the role model in their physical and social environments. Research has shown that parents' health behaviours were associated with adolescents' health behaviours (Sanchez et al., 2007). Household dietary habits, behaviours and lifestyle that result in obesity are passed on to children (Sanchez et al., 2007; Whitaker et al., 1997). Family dietary practices include determinants of behaviours such as attitudes, taste preferences, social influences and perceived behavioural control (van der Horst et al., 2007).

Economic boom influences patterns of eating

According to Musaiger (1987; 1993-94), owing to the economic boom of the last three decades the Gulf countries, including UAE, have experienced rapid changes in dietary patterns and habits coupled with an inactive lifestyle. This has also led to a change from 'the traditional diet characterized as a high-fibre content and low in fat to a more westernized diet with high fat, free sugars, sodium and cholesterol' in countries such as Bahrain, Saudi Arabia and the UAE (Zaal et al., 2009). Frequent snacking and binge eating during the day but mainly at night, television watching and inability to engage in physical activities were related to social and religious norms resulting in sedentary lifestyle.

Musaiger & Abuirmeileh (1998) conducted a food consumption community-based survey in 1993 that consisted of 1,122 men and 1,090 women from all seven Emirates of the UAE. It was found that older men (50 years and above) were more likely to eat traditional food (such as fish, vegetables and rice) than younger ones (20-49 years) while there was no significant difference in young and elderly women's consumption of traditional foods. Musaiger & Abuirmeileh (1998) concluded that traditional food practices and beliefs are predominantly embedded in the older rather than younger populations. The recent UAE market as a developed/developing economy has an insurmountable socio-cultural effect on the shift in eating patterns (Thomas et al., 2010). Moreover, in some self-sufficient high economy developing countries, affluence and high SES is associated with a taste for fast foods, sugary drinks and lack of exercise.

Mental health state affecting eating patterns

Young adult women have been shown to be susceptible to eating disorders (Thomas et al., 2010). Saunders (2004) defined binge eating disorder (BED) in the fourth edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) as having two main features:

1) 'Eating in a discrete period of time an amount of food that is definitely larger than most individuals would eat in a similar period of time under similar circumstances.'
2) 'Sense of lack of control over eating during the episode.'

Saunders (2004) related binge eating disorder to United States patients with gastric bypass surgery who consistently reported loss of control over their eating pattern and in some cases subsequent weight gain. Certain food cravings were also reported along with the inability to eat these foods moderately. Therefore, assessing overweight people and giving advice on ways to modify patterns of meals and snacks that includes binge and nocturnal eating is an important 'secondary' part of preventing obesity (Williams and Fruhbeck, 2009). In terms of psychosocial variables such as depression, Sanchez et al. (2008) in a food frequency cross-sectional study, found that 'higher depression scores among sedentary women confirms that there is a relationship between depression and sedentary behaviour. There has been no research found on the effect of the mental state such as depression on obesity in the UAE.

2.5.2 Inactive and sedentary lifestyle

An active lifestyle is a balanced lifestyle. According to Williams & Fruhbeck (2009), 'physical activity is the most variable determinant of total energy expenditure ....' Physical activity is also known to lessen the risks of obesity and the adverse effect of obesity in type 2 diabetes, coronary heart disease and cardiovascular diseases that lead to mortality (Hu et al., 2001; Hu et al., 2003; Hu et al., 2004; Stampfer et al., 2000; Stevens et al., 2002; Van Gaal et al., 2006). In the UAE studies have shown that physical activity in childhood and adolescence may affect activity patterns in adulthood in the UAE (Berger & Peerson, 2009; Henry et al., 2004).

Sedentary lifestyle and behaviours such as television watching, driving cars, sitting, sewing, playing board games as well as playing computer games and mobile phone games have been reported to result in lower metabolic expenditure (Hu et al., 2003). In the prospective cohort study of US women by Hu et al. (2003), it was indicated that there were three mechanisms observed for the positive association between television watching and obesity and diabetes risk. The first is that television watching takes the place of exercise and physical activity. Women in their study who spent a lot of time watching television exercised less. Secondly, television watching resulted in increased dietary intake and unhealthy eating patterns due to the fact that participants in the study who spent more time watching television tended to snack as a result of food cues and advertising on the TV. Lastly, compared with other types of sedentary activities such as sewing, driving, reading and writing, television watching is considered to result in lower energy expenditure.

Behavioural modification of lifestyle and dietary changes therefore can have important and long term benefits in reducing the rise in overweight, morbid obesity and chronic diseases. Sedentary behaviour as a lifestyle (independent of any exercise levels) is significantly associated with the risk of obesity and type 2 diabetes is confirmed by the findings of Hu et al. (2003) in the United States. A cohort study in the United States of 2,506 women and 2,860 men in the Lipids Research Clinics Study shows that among men and women greater body weight increases the risk of death from any cause and death from cardiovascular diseases (Stevens et al., 2002). The relative risk associated with excess weight was higher among younger subjects in the study. Fitness and fatness was considered as risk factors for mortality with fitness reported as not being a factor for reversal of risks associated with excess adiposity (Stevens et al., 2002).

In the UAE, there has been little research on the importance of an active lifestyle. As noted by Berger & Peerson (2009), only few studies are available on the health and well-being of UAE women in relation to physical exercise. In a study of 400 female students aged 18-25 years, Kerkardi (2003) reported that social, cultural and religious norms restrict many UAE university female students from participating in outdoor sporting activities. The result of the study indicated that 13% were underweight, 60.9% were normal, 19.4% were overweight and 6.7% were obese. Sixty-two percent of these female students were not involved in any kind of sports and 38% practiced mild exercise (walking). According to Musaiger (1987) as cited in Henry et al. (2004), factors that contribute to inactive lifestyle in the UAE include increased number of housemaids, excessive use of cars, labour-saving devices and cheap human labour in general. Lack of nearby parks, co-existing diseases, safety, lack of time and women's inability to use public gyms or sport and recreation centres have been reported as barriers to physical activity in UAE. Only a few sports clubs have exclusive facilities for ladies (Al-Kaabi et al., 2009). Aside from a sedentary lifestyle; perceptions of body image and people's beliefs have been observed to contribute to unhealthy lifestyle in society (Musaiger, 1993-94; Thomas et al., 2010). Other factors such as the high temperature during the day and the type of clothing acceptable for women also impede physical activity. Berger & Peerson (2009) reported that the UAE climate can be an obstacle to physical activity levels of young Emirati women especially during the hot summer period of the year.

In a study of 58 adolescent females aged 11-16 years in UAE, Henry et al. (2004) indicated that the physical activity levels (PALs) and estimated total energy expenditure (TEE) are quite low compared to females of similar age groups in other countries. Data analysis of the girls' diaries revealed the median number of hours spent watching television to be 2.5 per day among the 11-13 years and 14-16 years alike. The number of hours was higher during the weekends. Henry et al. (2004) pointed out that the weather played a role in the low PALs observed. In a cross-sectional survey by Carter et al. (2004) to determine the reproductive and lifestyle characteristics of 535 UAE female citizens, they reported that physically active UAE women were more likely to be younger and better educated. Due to the segregation of sexes in a Muslim country such as the UAE, a public health plan and intervention for improving physical activity must be set out separately for males and females.

Henry et al. (2004) and Berger & Peerson (2008) associated physical activity and levels of inactivity with the influence of social norms. Berger & Peerson (2008) conducted semi-structured, in-depth interviews with young Emirati women aged 18-27 years old at a women's college in Fujairah, UAE that yielded a qualitative data. The women confirmed that physical activity is not valued. The majority of the study sample did not engage in physical activity and were unclear and unconcerned about any benefits it might have. Qualitative studies have also confirmed barriers to adequate health promotion strategies in the UAE (Ali et al., 2010; Al-Kaabi et al., 2009). The social ecological model of health promotion in the UAE was researched by Ali et al. (2010). They examined the barriers and facilitators of weight management from the perspectives of Arab women at risk for type 2 diabetes. The main factors of concern were low motivation, lack of social support, lack of culturally appropriate exercise facilities and socio-cultural norms for outdoor activities.

2.5.3 Perceptions of overweight and beliefs about obesity

Many studies claim that the desire and motivation to lose weight is driven by the perceived threat to health and well-being of individuals. Perceptions and beliefs about obesity have been observed to influence the behaviours, attitudes and lifestyle of people (Blokstra et al., 1999; Fagan, 2008; Moore et al., 2010; Rasheed, 1998). On the other hand, cultures, traditions and education are likely to influence perceptions, beliefs, behaviours, attitudes and consequently the lifestyle of an individual. Inaccurate perceptions and beliefs about obesity have been shown to negatively affect the treatment, management and prevention of obesity (Al-Sendi et al., 2004; Blokstra et al., 1999; Musaiger, 1994).

According to Tonstad et al. (2006) in a study of the Norwegian population, 'it is important to gain a better understanding of how people describe their weight and motivation to lose weight'. In this important study, the researchers looked in detail into the reasons people want to lose weight and concluded that the main motivation for losing weight was for better health and well being rather than for appearance. Even though concern about self-image is an important factor in avoiding stigmatization, health and wellbeing proved to be of greater concern. They also believed that diet and exercise was the best way to treat overweight and obesity. In a cross-sectional study by Sanchez et al. 2008, some psychosocial variables such as self-efficacy beliefs emerged as significant correlates of health behaviours. Self-efficacy was specifically associated with physical activity and the fruit and vegetable guidelines (Sanchez et al., 2008).

A small number of important studies are available from the UAE on perceptions and beliefs about overweight and obesity. Results of findings of a cross-sectional study of 203 female university students in the UAE by Musaiger (1993-94) indicate that 80% of overweight students had accurate perceptions of their body weight whereas a majority of underweight students' perceptions were inaccurate. Overall, 30% of the girls with normal weight perceived their weight inaccurately while 80% of overweight girls considered themselves to be 'obese'. A high percentage of these university students were reported as having no knowledge of their weight and height measurement but were shown to have perception of physical shape. The source of knowledge and attitudes was mainly from magazines as well as nutritional information from television, university curriculum, radio and friends. These findings, according to Musaiger, are similar to those of a study conducted in Bahrain on adolescents by Musaiger et al. (1991). Moreover, the UAE survey (Musaiger, 1993-94) indicated that there were erroneous beliefs among female students that 'bread contains less energy than rice'; there was the lack of knowledge of their weight, height and BMI, and they were also less informed in relation to nutrition, exercise, obesity and the consequences of the lack of a balance lifestyle. That is, behavioural excesses of food consumption and behavioural deficits of physical activity and the resulting implications and complications were unknown by them. Fifty percent reported that they did not know the health complications of obesity, 50% knew their height and 75% knew their weight (Musaiger, 1993-94).

A later study was conducted among female students of Zayed University in the UAE by Thomas et al. (2010) using 'Eating Attitudes Test 26-item version (EAT-26) along with the figure rating scale. A figure rating scale (FRS) is a visual scale used to self-assess body size or shape estimation, preference and dissatisfaction'. Twenty-four percent of the students scored above the EAT-26 cut-off, suggesting disordered eating attitudes and a possibility of eating disorders. A significant number (74.8%) were not satisfied with their body image. Disordered eating attitudes correlated positively with dissatisfaction with body image and negatively with the ideals of body image of the EAT-26 (Thomas et al., 2010). According to Musaiger (1987, 1994), there is a preference for weighty women of marriageable age in most Arab Middle Eastern countries as this enhances the family's status. Twenty-six percent of the girls in the study by Musaiger (1994) believed that plumpness was more acceptable to men

and this tends to encourage the girls to be plump. On the other hand, Thomas et al. (2010) indicated that the high rate of abnormal eating attitudes and disorders could be the result of their sample population, including newlyweds or those engaged to be married. The mean age of participant in the study was 19 years, whereas the average marriage age for UAE females is 23 years. However, the study cannot be generalised because it was based on only one university setting. The instrument for assessment was only in the English language and there was no BMI data for the study (Thomas et al., 2010).

2.6 Overweight, obesity and socioeconomic status

In most countries of the world, rapid economic growth has disrupted traditional structures, social relationships and ideologies (McMichael, 2000). Socioeconomic stratification widened by national economic forces has resulted in increased prosperity for certain individuals. Those who work in sectors not linked to the national economy may suffer health inequality or food insecurity (McMichael, 2000) and they are not likely to be highly informed or educated. Differences in environments and the resulting effects of local food, exercise or activity environments and neighbourhood socioeconomic status (SES) have been linked to access to healthy foods and opportunity to exercise (Moon, 2010). In these areas, the effect of living in socially and economically disadvantaged areas and being overweight or obese was significant for women (Harrington & Elliot, 2009). Educational attainment is also found to be inversely correlated with BMI whereas income and economic development tend to be risk factors (Monteiro et al., 2001). Overweight and obesity vary across socioeconomic classes and across countries. Low SES is often associated with overweight and obesity in most Western countries (McLaren, 2007; Paeratakul et al., 2002). Meanwhile, studies conducted by some researchers concluded that in most developing countries, affluence or higher SES is often positively linked to overweight and obesity (Kabir, 2005; McLaren, 2007; Stunkard, 2000). On the other hand, Monteiro et al. (2004) indicated that obesity can no longer be solely considered a disease of the higher SES in the developing countries due to the shift of obesity towards the poor.

According to Thomas et al. (2010), ‘the UAE enjoys one of the highest per-capita gross domestic products (GDPs) in the world’. This has resulted in an increased health inequality

especially in the area of obesity and other related diseases such as type 2 diabetes. In the UAE, the environment (hot climate) and culture are seen as a constraint on both individual behaviour and the various interventions and health promotion measures that are directed to combating obesity. For example, lack of physical activity and exercise and the declining levels of physical labour and division of labour (Musaiger et al., 2003; Zaal et al., 2010) in the microenvironments such as homes, workplaces, schools and universities as well as macro-environments such as the media, Ministry of Health, medical school, urban and rural settings (Swinburn et al., 1999) are associated with differences in SES in these communities (Musaiger et al., 2003; Zaal et al., 2010). Typically, driving displaces walking, labour-saving devices replace manual devices and TV and computer games exist in place of participation in sport (Williams & Fruhbeck, 2009).

In the review of studies published by Monteiro et al. (2004) on the SES and obesity in developing countries, they concluded that the burden of obesity shifts towards lower SES groups as the country's gross national product (GNP) increases. Due to the fact that income is the most important indicator of SES, the UAE as a high income developing country needs current research to establish its overweight and obesity status in relation to SES.

2.7 Obesity epidemic in Middle Eastern countries, including United Arab Emirates

Overweight and obesity are known to be the main risk factor for diabetes and cardiovascular diseases (van der Horst et al., 2007). Results of a survey conducted by the UAE Ministry of Health and the World Health Organization in 2000 revealed that 13.5% of the population is diabetic and this proportion is expected to rise to 19.3% by 2030 (WHO, 2010c). An estimated 19.7% of the population was reported to have diabetes in 2007 and one in every four Emiratis are predicted to become diabetic by the age of 60 (MOH, 2010). According to the International Diabetes Federation, as cited in Al-Kaabi et al. (2008), prevalence of diabetes in the UAE is the second highest in the world (WHO, 2010c).

Studies have shown that obesity is higher among females than males in the Middle East and the Arabian Peninsula as a whole (Al-Mahroos & Al-Roomi, 1999; Al-Othaimeen et al., 2007; Musaiger, 2011; Sheikh-Ismail et al., 2009). However, overweight has been found to be more likely to be prevalent among men than women in most Eastern Mediterranean

Region (EMR) countries (Musaiger, 2011). Even though prevalence studies have been done in the UAE, there are limited data available in the Middle East on the environmental risk factors for obesity (Sheikh-Ismail et al., 2009), especially for female university students although as shown in Appendix M, there is a very high population percentage of overweight women overall in the Middle East.

Obesity and its co-morbidities, especially type 2 diabetes have reached epidemic proportions in the UAE (Musaiger and Radwan, 2003; Sheikh-Ismail et al., 2009) and the rest of the developed world (Mann et al., 2004). Current data from the WHO Global Infobase, 2010 show that the prevalence of obesity in UAE has reached 42% and overweight and obesity is 71.6% in women. Prevalence of obesity among women in Bahrain, Saudi Arabia, Kuwait, Egypt and Jordan are 37.9%, 36.4%, 55.2%, 48% and 37.9% respectively (WHO Global Infobase, 2010a). Prevalence of overweight and obesity taken together among women in Bahrain, Saudi Arabia, Kuwait, Egypt and Jordan are 69.5%, 65.9%, 80.4%, 76% and 65.4% respectively (WHO Global Infobase, 2010b). A review of overweight and obesity rates in Middle Eastern countries indicates that increasing obesity levels vary considerably between rural and urban populations (Rigby et al., 2009). According to Azizi (2001), 38% of women ≥ 20 years of age in Tehran, Iran, are overweight and 30% are obese, rates similar to those in Western countries. In contrast, in rural areas of Iran, Ghaseemi et al. (2002) reported that obesity was less prevalent than in the city. Similarly in Egypt, urban dwellers have a prevalence rate of 40% overweight and 45% obesity among women compared to figures of 30% overweight and 21% obese among their rural counterparts (Galal, 2002; Rigby et al., 2009).

In a systematic review conducted by Musaiger (2011) on overweight and obesity in the Eastern Mediterranean Region (EMR), Musaiger noted that the prevalence of overweight (BMI >25 kg/m2) and obesity (BMI >30 kg/m2) was highest in the Middle Eastern countries second only to North America. Factors that determine and contribute to overweight and obesity in the Middle East according to Musaiger (2011) include nutrition transition, physical inactivity, food subsidy policy, SES, eating out, frequent snacking, skipping breakfast, short sleep duration, body image perceptions, length of television viewing, sugary beverages and cultural standard and norms for Middle Eastern women. Owing to the fact that overweight and obesity have become a public health problem in the Middle East, there is the need for

more studies and action on the subject to bring about comprehensive knowledge of the causes and risks in order to control the obesity epidemic.

2.8 Obesity, diet and lifestyle in the United Arab Emirates

Several studies have indicated that change in diet and lifestyle affects the prevalence of overweight and obesity in the UAE (Musaiger et al., 2003; Musaiger, 2004; Musaiger, 2011). Table 2.1 shows studies of risk factors for overweight and obesity in UAE such as related to diet and physical activity. Musaiger et al. (2003) reported the prevalence of obesity among male university students to be 35.7%. This was compared to the result of 28.8% prevalence of obesity among female students by Musaiger and Radwan (1995), indicating that obesity was more prevalent among adult males than females in the Arab Gulf. The time elapsed between these studies, however, limits comparison of finding.

Table 2.1: Summary of studies on overweight and obesity risk factors in United Arab Emirates

Author (year)	Sample/ Methods/Findings
Musaiger (1993-94)	N=203 female university students aged 18-30 years Cross-sectional study -Fifty-three (53%) believed that overeating was the main cause of obesity while 26.1% believed it to be overeating and inactivity - Fifty percent (50%) did not know the health implications of obesity and body weight perception was found to be inaccurate in 30% of the girls and 80% overweight reported themselves as obese - Fifty percent (50%) knew their height and 76% knew their weight
Amine and Samy (1996)	N=566 female student of UAE University Interview using reference value weight for height - Over ten percent (10.8%) of the students were overweight and 30.6% were obese - The prevalence of obesity increased with age, obesity among students was associated with obesity during childhood, the presence of obesity among one or both parents, food intake between meals and in particular fast foods
Musaiger and Abuirmeileh (1998)	A proportional random sample of 1,122 men and 1,090 women from the seven Emirates of UAE Data from 1993 - Consumption of fruit and vegetables and milk was low - Elderly people were more likely to consume traditional foods more than young people
Musaiger et al. (2000)	Women attending the out-patient clinics in Tawam Hospital, the main and the university hospital in Al-Ain City. Nutritional status measures using BMI - Over nine percent 9.2%, 29.8% and 38.4% respectively were underweight, overweight and obese

Table 2.1. continued

Author (year)	Sample/ Methods/Findings
Al-Hourani et al. (2003)	N=898 females aged 11–18 years from five of the seven Emirates were recruited from five of the seven Emirates with the highest resident Emirati population Reference data: National Health and Nutrition Examination Surveys (NHANES) using the BMI classification - Fourteen percent (14%) and 9% of the sample were classified as at risk for overweight or overweight, respectively - The proportion of the risks for overweight ranged between 7–19% and the prevalence of overweight ranged between 6–15% - A high proportion of adolescent females in the UAE are overweight or at risk for overweight
Kerkadi (2003)	N=400 female university students of UAEU aged 18-25 years Prevalence study using BMI 'The prevalence of underweight, overweight and obesity were 13 %, 19.4% and 6.7% respectively' Sixty-two percent of students did not practice any kind of sports, 44.8% of the respondents did not take breakfast, 34.9% took fast food at least once a day, and 52.3% took only 1 to 2 meals /day Findings of the food consumption patterns showed that 54.4% of the participants consumed low cereal diets, 51.5% consumed diet low in vegetables, 49.5% consumed diet low in fruits, and 46.7 % of the participants consumed a diet high in fat
Musaiger et al. (2003)	N=300 male university students of UAEU aged 18-25 years Cross-sectional survey using BMI - The prevalence of obesity was 35.7% - The risks of obesity was found to be greater among those who watched TV more than four hours a day and those who had a family history of obesity
Musaiger and Radwan (1993; 1995; 2003)	N=215 university female students aged 18-30 years Cross-sectional study based on BMI - Nineteen percent (19%) of the females were overweight and 9.8% were obese - Proportion of obesity was highest among females aged 18 years (31%)
Carter et al. (2004)	N=535 women in Al Ain, United Arab Emirates Cross-sectional survey was carried out using the stratified two-stage sampling technique - 'The prevalence of obesity (defined by body mass index ≥30) was very high (35%; 95% CI 31-39%)' - 'Prevalence of obesity was associated positively with age and negatively with education ($p<0.001$ for both)'
Henry et al. (2004)	N=58 adolescent females aged 11–16 years were recruited from two female-only governmental schools in Abu-Dhabi Physical activity patterns were determined from a 3-day activity diary and Total energy expenditure (TEE) was estimated using a factorial approach. - The number of hours per day spent watching television (median and inter-quartile range) was 2.5 (2.3–3.1) in 11–13 years and 2.5 (2.3–2.8) in 14–16 years - Television-watching was significantly higher during the weekend than schooldays - The amount of physical activity undertaken by adolescent females in the UAE was very low

Table 2.1. continued

Author (year)	Sample/ Methods/Findings
Kerkadi et al. (2005)	N=900 female primary school children aged between 5-14 years Prevalence study using a questionnaire and BMI measurement - Prevalence of the risk of overweight was 11.1% while prevalence of overweight was 15.8% - Primary school female children had high prevalence of overweight
Malik and Bakir (2006)	N=4381 children aged 5–17 years Data from 1999 UAE-National Iodine Deficiency Surveillance Study using BMI of IOTF criteria - 'Nine hundred and forty-four (21.5%) of children were overweight and 601 (13.7%) of these were obese. More girls than boys were overweight (22.9% vs. 20.2%; $P \leq 0.001$)' - 'Boys in the rural areas had the lowest prevalence (23.6%) and were the least likely of all the children to be either overweight (OR 0.785, 95% CI 0.629–0.974) or obese 0.732 (95% CI 0.591–0.912)'
Al-Kaabi et. al. (2008)	N=409 diabetic patients Cross-sectional studies - Twenty-four percent read food labelling, 76% reported inability to distinguish clearly between low and high carbohydrate index food items and none was reported counting calorie intake
Al-Kaabi et al. (2009)	N=390 diabetic patients Cross-sectional studies - Three percent reported physical activity levels that met the recommended guidelines - Forty-four percent were obese and 34% were overweight
Berger and Peerson (2009)	N=20 Muslim college students aged 18-27 years Qualitative study using semi-structured interview -The findings revealed that none of the students had been exercising since primary school and at the time of the research -There were indications that none of the students showed 'noteworthy interest in the topic'
Sheikh-Ismail et al. (2009)	N=724 females from the seven Emirates aged 20-90 years Prevalence of overweight and obesity using BMI and mid-upper-arm circumference measurement -'The prevalence of overweight and obesity were 27% and 16%, respectively' 'The age group between 30 and <60 years had the highest prevalence of overweight (33%) and obesity (24%)'
Zaal et al. (2009)	N=661 adolescents UAE nationals (324 boys and 337 girls) aged 12-17 years Cross-sectional study - Over thirty percent (30.5%) of obesity was observed among boys 14 years of age and 35.4% among 13 years girls - 'Fast foods showed a significant association with obesity in girls (P = 0.007), but not in boys (P = 0.745). The risk of obesity was higher in boys who ate fast foods at home (OR = 1.3; CI 0.5-3.2) but less in girls (OR = 0.2; CI 0.1-1.0)'

Table 2.1. continued

Author (year)	Sample/ Methods/Findings
Thomas et al. (2010)	N=228 female students of Zayed University with mean age 19.84 years Eating Attitude Test 26 item version (EAT-26) along with Figure Rating Scale - Twenty-four percent scored above the EAT-26 cut-off while 74.8% were dissatisfied with the estimation of their current body image - Disordered eating attitudes was positively correlated with body image dissatisfaction and negatively correlated with body image ideals
Zaal et al. 2010	N=661 adolescents UAE nationals (324 boys and 337 girls) aged 12-17 years Cross-sectional study by measurement of weight, height and blood pressure -The mean BMI of males was higher than females except for the age group 13 years -High prevalence of obesity was associated with high blood pressure
Ali et al. (2010)	N=75 Emirati national women aged 20–60 years Qualitative grounded theory - Barriers that restrict participants from outdoor physical activities included 'low motivation, lack of social support, competing demands, lack of culturally-sensitive exercise facilities and socio-cultural norms'
Trainer (2010)	N=50 young Emirati women aged 18-25 years Epidemiological prevalence of underweight, overweight, and obesity combined with qualitative data - 'Almost 90% of middle-aged Emirati women in the UAE are overweight/obese, and yet in this study, almost 35% of female university students were underweight.' - 'Most participants expressed considerable concern about gaining weight once they got married.'

In a report by Musaiger (2004), prevalence of 3%-9% overweight and obesity was observed among preschool children and 12%-25% in school aged children in the Eastern Mediterranean. The prevalence of overweight and obesity among adolescents was 15%-45%, adult women were 35%-75% and men were 30%-60%. According to Musaiger (2004), obesity in the Eastern Mediterranean Region is more prevalent in the 'young' aged 30–50 years, the better educated and in women compared with men. Musaiger noted that currently married females or those unemployed, and those who watched television more than two hours per day have higher levels of obesity than others. Consumption of fresh fruit less than three times a week and car ownership were also factors that contribute to the prevalence of obesity (Musaiger, 2004).

The assessment of obesity, lifestyle, and the reproductive health needs of 535 female citizens of Al Ain (UAE) using a cross-sectional survey conducted by Carter et al. (2004), showed

that the prevalence of obesity was associated positively with age and negatively with education. Carter et al. (2004) also found the prevalence of obesity in the age group 20-29 years to be higher than in previous studies. They found that the prevalence of overweight and obesity of the population was 27% and 35% respectively. Al-Kaabi et al. (2008) also argued that diet (as self management) was the cornerstone for the treatment of diabetes by assessing the dietary practice among diabetic patients in the UAE. Seventy-six percent of the diabetic patients were reported as unable to distinguish clearly between low and high carbohydrate index food items and no one reported counting calorie intakes.

Researchers such as Zaal et al. (2009) in a cross-sectional study investigated and assessed the dietary and behavioural habits associated with the obesity status of 661 adolescents (324 boys and 337 girls) in Dubai. The result showed that the proportion of overweight (18.5%) and obese (22.2%) males is higher than that of overweight (13.1%) and obese (20.5%) females. They concluded the rising levels of obesity were an indicator of improved socio-economic status. Furthermore, a study to determine the prevalence of overweight and obesity for females' aged 20-90 years in UAE was conducted, with findings indicating the highest prevalence was in the 30-59 year old age group (Sheikh-Ismail et. al, 2009).

2.9 Conclusion

In conclusion, factors that influence overweight and obesity are largely similar across populations and are on the increase owing to a trend in changes in the economy, modernisation, industrialisation and socioeconomic status. This has resulted in rapid changes in diet and physical activity patterns in most developing countries, a move away from the traditional lifestyle that encourages active movement and healthier diet. Due to the fact that individuals and communities are exposed to a lifestyle prone to becoming overweight and obese, health promotion and health education programmes should be targeted at the major determinants of health. In other words, the social, economic and environmental aspects of lifestyle as well as the knowledge, attitudes and skills needed to develop a healthy lifestyle from gestation and infanthood to adulthood and later life should be the focus of health professional for overweight and obesity prevention, management and treatment.

This review of literature has assessed the known risk factors and behaviours that contribute to overweight and obesity in UAE as a developing country and around the world. Even though a lot of work has been done in the past, it is apparent that current research on overweight and obesity are scarce, especially in the literature on physical activity amongst women in the United Arab Emirates. Further investigations that examine physical activity and dietary patterns of this group longitudinally as well as qualitative enquiries into the barriers and facilitators of healthy dietary and physical activity patterns are needed.

This work should contribute to the gap in the knowledge of lifestyle choices and beliefs about overweight and obesity that would enable the development of efficient and effective interventions for prevention, management and treatment of overweight and obesity in young adult women in the United Arab Emirates.

3 Research methods

3.1 Introduction

The purpose of this study was to identify known risk factors for obesity, self image and opinions about overweight and obesity in a cohort of female students in the United Arab Emirates (UAE) and to establish levels of obesity in this population. The method used in this study was a cross-sectional survey with a self-administered paper-based questionnaire. The survey collected information on lifestyle choices and the risk factors that contribute to obesity. Height, weight and waist circumference measurements were also taken. This chapter describes the process of designing and carrying out this research.

Ethical approvals were obtained from United Arab Emirates University (UAEU) and the University of Canterbury. This study was then conducted from 16 April to 19 May 2011 on the campuses of the UAE University Al Ain amongst enrolled female students aged 18-30 years.

3.2 Research setting

The United Arab Emirates University (UAEU) is located in Al Ain, the second largest city in Abu Dhabi. The UAEU was established in 1976 and it is the first and foremost comprehensive national university in the UAE (UAEU, 2011). The university provides free education, accommodation and transportation for its undergraduate students. The female students' residential housing consists of Maqam 1, Maqam 2, Maqam 3, Maqam 4, Maqam 5 and Tawam hostels. The Food Services Department (FSD) provides and caters for the dining needs of UAEU students. The department is made up of eight restaurants and more than ten cafes. Nevertheless, students can still dine out as often as they wish. Students also have access to free door-to-door delivery of fast food in the hostels.

3.3 Sample size determination

A total of 9,456 female students registered at UAE University during the 2009-2010 academic year, representing 76% of the entire student population of the UAE (UAEU, 2010). The number of registered female students for the 2010–2011 academic year was 8,087 and this was used as the total number in the population. The sample size of 323 was determined

for this survey (see Appendix H for sample size calculation). All students were identified from student records and were invited to participate in the study. Male students of all ages, female students aged below 18 years and above 30 years were excluded from the study. The other exclusion criterion was pregnancy. A total of 323 female students were initially sought for the study.

3.4 Sampling strategy

Following a duly approved research proposal, the female student body was notified in order to enable adequate information and advertisement of the survey. Access to the female residential hostels were requested and granted. As proposed, participants were selected by faculty in a stratified random sampling from students' records and invited to participate in the study by emails. However, there was virtually no response to the emails from the students.

In view of this an alternative sampling strategy had to be devised. A non-random opportunistic sample was sought from the female student body. Three recruitment opportunities were made available by the University:

24-28 April 2011: Exhibition of Health, Nutrition and Fitness at the UAEU's new campus
1-4 May 2011: Maqam 2 Residential Hostel
9-11 May 2011: Tawam Hostel

3.5 Recruitment of participants and administration of questionnaire

Exhibition of Health, Nutrition and Fitness at the UAEU new campus

Recruitment of participants was conducted during the 1st Exhibition of Health, Nutrition and Fitness at the UAE University's new campus between 24 and 28 April, 2011. To initiate the research, a stand was set up and interested students were invited to participate in the study. The printed questionnaires (both English and Arabic version) were taken in a box to the exhibition. Some chairs and two tables were arranged at the stand. At the stand, questionnaires were administered by giving each student the information sheet, consent form and questionnaire to fill in the answers.

The incentives offered were; information on their weight, height, BMI and waist circumference. There was also the opportunity, with consent, of referral to specialist nutritionist advisors from UAEU if they were identified as obese. Students came over to the stands mostly in pairs but there were some who came alone or in groups. The instruction 'please read the information letter, sign the consent form and fill in the questionnaire' was given to each potential participant. The information letter was read and the approved consent form was signed by participants.

Maqam 2 Residential Hostel

Permission was given from the Head of the Residential College to undertake the research, and notices and invitations were posted for the research in the residential hostels for the participation of students on the 1st of May 2011. From the 1st-4th of May 2011 data were collected from consenting students at the nutrition clinic located in Maqam 2 residential college hostel. The same procedure of recruitment of participants and administration of questionnaire was used in the Maqam 2 Residential Hostel.

Tawam Hostel

In the Tawam Hostel, the hostel director authorized the administration of the questionnaire to the students in the cafeteria within the hostel. A designated room in the hostel's cafeteria was made available from 9-11th of May 2011. There were two long tables and about a dozen chairs in the room. During the three days of the research, the printed questionnaires (both English and Arabic version) was taken in a box to Tawam hostel at around 6.00 pm each day. Students who came in to the restaurant for dinner and those who were interested in the study came in ones, or pairs and groups of three to participate.

Across the three research sites, 76.6% of respondents overall requested for the Arabic version of the questionnaire during the recruitment. The problem envisaged was ability to recall the 30-day dietary related questions.

3.6 Description of the instrument

The survey instrument and the anthropometric measurements were designed to access the prevalence of lifestyle variables and known risk behaviours for overweight and obesity in the study group. The survey instrument contained items related to the participants (P), exposure (E) and outcome (O) of the risk behaviours on overweight and obesity as well as the outcome (O) of perceptions and beliefs on overweight and obesity.

3.6.1 Questionnaire design

The questionnaire was adapted from three other research instruments, two of which have been validated among populations similar to the UAE population group. The items in the questionnaire were based on the following validated questionnaires:

1) Physical Activity Questionnaire (PAC) for age >15 years:- University of North Carolina UNC Gillings School of Global Public Health in 2009 (see Appendix E). The questionnaire was originally validated in 2009 among UAE students aged >15 years and validation information can be found on the website as follows:- http://www.sph.unc.edu/uae.

2) UAE Global School-based Student Health Survey (GSHS) Questionnaire in 2005 (see Appendix E). The questionnaire was originally validated in 2005 among UAE school-based students aged 13-15 years and the validation information can be found on the website as follows: http://www.who.int/chp/gshs/2005_United_Arab_Emirates_GSHS_Country_Report.pdf.

3) Questions used by Professor Serena Tonstad et al. (2006) in "Weight concerns and beliefs about obesity in the Norwegian population" in 2006 (see Appendix E). The questionnaire was originally validated in 2006 among Norwegian population and is of relevance to the UAE population due to the significant contributory factor of perceptions and beliefs to obesity. There was no UAE validated questionnaire for these types of questions found. Information on the questionnaire can be found on the website: http://foodandnutritionresearch.net/coaction/index.php/fnr/article/viewArticle/1549.

3.6.2 Description of the questionnaire

The questionnaire was divided into five parts. These included the demography, dietary habits, physical activity, perceptions of body weight and beliefs of obesity and the record of self-reported and actual anthropometric body measurements. Provision was made to record each participant's weight (kg), height (cm) and waist circumference (cm). The survey was then translated into Arabic which is the first language of most of the participants. Therefore, each participant had the choice of either the Arabic or English version of the questionnaire (Appendix E or F).

The questionnaire consists of five sections:

Part One: This demography section has 10 questions and it served as an introduction to the survey. Questions 1-3 were open-ended questions while questions 4-10 were Likert scale questions.

Part Two: In the dietary habit section, eight questions on frequency of certain foods eaten and the choice of foods eaten were asked.

Part Three: There were 12 questions on the frequency of physical activity and how active the participants are. Examples of active exercises were given in the questionnaire. If they were not physically active, the respondents were required to give the reasons why they did not engage in physical activities.

Part Four: Six questions on the perceptions of obesity and beliefs about overweight were asked in this part of the questionnaire. Participants were asked to assess their weight status. This was achieved by giving them choices of weight (underweight, normal, overweight and obese) from which they had to choose whichever was most applicable to them. Respondents were also asked if they would like to lose weight and how they believed overweight could best be treated.

Part Five: The last part of the questionnaire consisted of the record of the anthropometric measurements/data. Participants wrote down their weight in kilograms, height and waist

circumference in centimetres. Afterwards, the weight, height and waist circumference of the respondents were measured and recorded.

The face validity of the questionnaire was tested using a pilot study of 138 participants in a classroom setting in the faculty of Business and Economics. Two ambiguous words were identified in the English version when four participants from the pilot study asked for the clarification of the words. The words ‘alleviated’ and ‘heredity’ were therefore changed and replaced with ‘reduced’ and ‘genetics’, respectively, as these were more familiar words to the students.

3.7 Data collection

3.7.1 Self-complete questions

At each of the three sites, once consent had been obtained, students were offered the questionnaire to complete. The survey was conducted by utilising a self-completed questionnaire with Likert scale questions. Questions on lifestyle issues and health risk behaviours were asked in the survey and participants wrote down their answers and/or ticked, circled or marked their chosen answers. After filling in the questionnaire and with consent, the weight, height and waist circumference of the participants was measured and recorded immediately on the questionnaire. The duration of the survey completion for each participant was approximately five minutes.

3.7.2 Procedures to measure weight, height and waist circumference

The last page of the questionnaire invited the students to fill in self-reported weight, height and waist circumference. Thereafter, each participant’s weight, height and waist circumference were measured and recorded. All measuring equipment was checked and reset daily to ensure data validity and reliability. The safe procedures undertaken during the anthropometric measurement included nutrition counselling and curtains for shy students.

Students’ height was measured in centimetres (cm) and rounded to the nearest decimal using a portable Seca stadiometer. The Seca stadiometer consists of a plastic platform for foot positioning, a graduated metric height rod and a flat plastic headpiece that slides up and down

the height rod. Participants have to stand barefoot, eyes horizontal, shoulders straightened, heels touching the footplate and facing away from the instrument. The flat plastic headpiece was then lowered to touch their heads. Before taking measurements any hair clips or hair pieces were removed. The measurement was then recorded on the last page of the questionnaire.

Body weight of participants was measured in kilograms (kg) to the nearest decimal using the Tanita Body Composition Analyzer, model TBF-410. Once the instrument was turned on, 0.5kg was deducted from the total weight to account for the weight of the clothing worn by the students (the 'abaya', a loose usually black outer garment worn by Muslim women). There was the option of body type being either 'athletic' (regular exerciser) or 'standard' (not an exerciser), but all students answered 'standard' for the body type input. Gender, age and height were then entered into the Tanita TBF-410 analyzer. Students stepped barefoot onto the stainless steel (metal) foot-shaped part (foot plate) of the machine with their arms by their sides. After students were in position and the settings on the screen had become still, then, a print-out of the body composition was collected. The print-out consisted of the body type, gender, age, height, weight, BMI, BMR, bio-impedance, fat%, fat mass, free fat mass and total body water. The instrument was cleaned frequently with antiseptic wipes to avoid contamination and to provide a good hygienic environment for students.

A measuring tape was used to measure the waist circumference of consenting students. Students stood straight and were either breathing out or talking to friends. The tape was then put around them midway between the hip and the lower rib, and the measurement recorded in the questionnaire.

The questionnaire was acceptable and within the cultural norms for all the students. However, some students did not want their measurements taken and used the word 'haraam', that is, 'forbidden'. This is because they thought the measurement that I might record could 'stick' with them in reality and their body measurements/parameters might become undesirable. For example, a lower height measure than expected meant becoming shorter in height and this is considered unacceptable to them. This was even more of a concern than weight measures.

3.8 Data management

In total, 321 female students of UAE University completed the survey. Two students did not complete the questionnaire. The data collected from students in each location was recorded everyday and packed in a big A4 envelope. All the envelopes were labelled with the date of survey, venue and number of participants. The questionnaires were taken home and kept securely each day to maintain confidentiality of information and ensure data security. A spreadsheet (Microsoft Excel™) was used for data collection and data pre-processing. Further statistical analysis of the data for this report was done using SPSS™.

Following data entry, envelopes containing the questionnaires were parcelled and brought to the Health Sciences Centre in New Zealand. The de-identified data were entered into a password protected personal laptop. The data were then cleaned and recoded to improve the data quality. Both the electronic and paper copies were then locked in a secure cabinet in the Health Sciences Centre, University of Canterbury. Only the student, supervisors and advisors had access to the data. The data will be held securely for five years at the University of Canterbury and then destroyed.

3.9 Analysis of data

The data in the questionnaires were double checked, coded and transferred to MS Excel™ and PASW™ Statistics version 18.0 (by SPSS™ Inc.) for data pre-processing and analysis. The frequency distribution and cross-tabulation of the following variables were calculated.

Table 3.1. List of the explanatory variables used in the study

Specific information	Variables
Socio-demographic characteristics	• age in years • nationality • marital status • faculty of study • education level • mother's education level • father's education level • family history of obesity • taking any medication
Dietary intake patterns	• breakfast intake in the past 30 days • reasons for no breakfast intake • fruit consumption in the past 30 days • vegetable consumption in the past 30 days • soft drink consumption in the past 7 days • fast food consumption in the past 7 days • dairy products consumption in the past 30 days and • fried fatty food consumption in the past 30 days
Physical activity patterns	• vigorous activity in the last 7 days • time spent on vigorous activity • reasons for no vigorous activity • moderate activity in the last 7 days • time spent on moderate activity • reasons for no moderate activity • walking for at least 10 minutes in the last 7 days • time spent walking • reasons for not walking • time spent watching TV • time spent on the computer and • time spent sitting
Beliefs about overweight and obesity	• Do you want to lose weight? • Do you believe that heredity is very important, somewhat important, only slightly important or not at all important? • Do you believe obesity can be reduced by diet and exercise? • How do you believe that obesity can best be treated?

The data from the questionnaires and the electronic dataset are securely maintained at the Health Sciences Centre of the University of Canterbury.

3.9.1 Data pre-processing

During the data pre-processing, data integrity was checked by ensuring that all variables were correctly coded, all outliers and missing values (outliers were assigned the value "-999") were accounted for, and all outliers and missing data were identified. By graphically

examining the data using box and whisker plots, outliers were defined as those values for the continuous variables that were outside of the "whisker" returned by the graph. These data points were located 1.5 times the interquartile range from the 25th percentile value or 1.5 times the interquartile range away from the 75th percentile.

Table 3.2 describes the different transformations that were made to the data. This includes some variables initially treated as a continuous being recoded as categorical variables. The changed variables are shown in the Table 3.2. Variables not listed remained the same.

Table 3.2. Details of variables recoded

Variables and categories	Recodes
Age in years	**('agerec')**
"lowest age to 19"	'< 20'
"20 to 24"	'20-24'
"25 through to highest"	'≥ 25'
Nationality	**('natrec')**
UAE	'United Arab Emirates'
other GCC countries	'other Gulf Countries'
other Arab countries	'other Arab'
and all other nationalities	'others'
Taking any medication	binary variable ('yes' or 'no')
Fruit consumption in the past 30 days	
'I did not eat fruit during the past 30 days'	'no fruit consumption'
'Less than 1 time per day'	'no fruit consumption'
'one time per day'	'once daily'
'twice a day'	'2-3 times daily'
'thrice a day'	'2-3 times daily'
'four times a day'	'4 or more times daily'
'five or more times a day'	'4 or more times daily'
Vegetable consumption in the past 30 days	
'I did not eat vegetable during the past 30 days'	'no vegetable consumption'
'Less than 1 time per day'	'no vegetable consumption'
'one time per day'	'once daily'
'twice a day'	'2-3 times daily'
'thrice a day'	'2-3 times daily'
'four times a day'	'4 or more times daily'
'five or more times a day'	'4 or more times daily'
The same recode was used for dairy products and fried fatty food consumption data	

Table 3.2. (Continued)

Variables and categories	Recodes
Fast food consumption in the past 7 days 'I did not eat fast food during the past 7 days' 'Less than 1 time per day' 'one time per day' 'twice a day' 'thrice a day' 'four times a day' 'five or more times a day'	 'no fast food consumption' 'no fast food consumption' 'once daily' '2-3 times daily' '2-3 times daily' '4 or more times daily' '4 or more times daily'
The same recode was used for soft drinks consumption data	
Time spent on vigorous activity 'not applicable' 'never' 'don't know' 'less than 30 minutes per day' 'less than 1 hour per day' '2 – 3 hours per day' '4 - 6 hours per week' '7 or more hours per week' 'missing'	**'vigtrec'** 'not applicable' 'never' 'unknown' 'less than 1 hour per day' 'less than 1 hour per day' '2 – 3 hours per day' '4 or more hours per day' '4 or more hours per day' '-999'
Time spent on moderate activity (same as time spent on vigorous activity)	**'modtrec'** (same as 'vigtrec')
Time spent walking (same as vigorous activity)	**'walktrec'** (same as vigorous activity)
Time spent on the computer 'not applicable' 'never' 'don't know' 'less than 30 minutes per day' 'less than 1 hour per day' '2 – 3 hours per day' '4 - 6 hours per day' '7 or more hours per day' 'missing'	**'comptrec'** 'not applicable' 'never', 'unknown' 'less than 1 hour per day' 'less than 1 hour per day' '2 – 3 hours per day' '4 or more hours per day' '4 or more hours per day' '-999'
Time spent watching TV (same as time spent on the computer)	**'tvtrec'** (same as 'comptrec')
Time spent sitting (same as time spent on the computer)	**'sittrec'** (same as 'comptrec')
BMI for self-reported and actual measurements (BMI < 18.50) (BMI = 18.0 – 24.99) (BMI ≥ 25.00) (BMI ≥ 30.00)	 Underweight Normal Overweight Obese

The variable 'self- reported waist circumference' was removed since the majority of the participants do not know their waist circumference. The participants' BMI was calculated by entering the formula weight divided by height squared (kg/m^2) into the SPSS.

3.9.2 Univariate data analysis

All the data for continuous variables were converted to categorical or binary formats as described above (Section 3.10.1). The frequencies were calculated using SPSS™. Tables of the frequencies and percentages of the selected variables are presented in Chapter Four.

3.9.3 Bivariate data analysis

Following the univariate analyses, bivariate data analyses were conducted. For the bivariate data analyses, cross-tabulation of selected variables was used to develop the contingency tables. Chi-square tests of independence were used as the basis of the *p*-values to test the null hypothesis. The Chi-square tests were performed to test whether there was some association between any of the explanatory variables and the outcome variable. The cross-tabulations of the demographic variable, dietary habits, physical activity patterns and beliefs with the BMI status are displayed in the tables of Chapter 4. The dependent variables (BMI status) were converted to a binary variable; Not overweight [underweight (BMI < 18.50); normal (BMI = 18.0–24.99)] and Overweight [overweight (BMI ≥ 25.00); obese (BMI ≥ 30.00)]. The *p*-value is used to show the probability of the results and indicates whether the results were statistically significant ($p < .05$) which means that the observed difference is too large to be explained by chance alone.

Binary logistic regression was conducted to estimate the odd ratio in order to show statistical associations between age, marital status, faculty of study, dietary consumption patterns, physical activity patterns, and BMI status. Some of the respondents did not allow the measurement of their weight and height, therefore a number of missing data were observed in the tables. The results include the missing (no response) data. The outcome variables were weight-related variables. Measurements of weight and height were used to calculate the BMI (kg/m^2). The BMI was categorized into underweight (BMI<18.50), normal (BMI=18.0–

24.99), overweight (BMI ≥ 25.00) and obese (BMI ≥ 30.00) according to WHO classification (WHO, 2010). The outcome variable was converted to binary format that include "not overweight"='underweight OR normal' and "overweight='overweight OR obese'.

Research hypotheses

- Students have an accurate knowledge of their weight and height status.

  Null Hypothesis: Association (or a measure of association) between perceived and measured heaviness = 0.
  Alternative hypothesis: The measure of correlation between perceived heaviness and measured heaviness > 0.

- Respondents' age, marital status and family history of obesity contributes positively to overweight and obesity.

  Null Hypothesis: There is no association (or a measure of association) between body weight/BMI status and the age, marital status and family history of participants.
  Alternative hypothesis: There is a measure of association between body weight/BMI status and the age, marital status and family history of participants.

- Fast food and soft drink consumption patterns are not related to overweight and obesity status.

  Null Hypothesis: There is no association (or a measure of association) between body weight/BMI status and the fast food and soft drink consumption patterns of participants.
  Alternative hypothesis: There is a measure of association between body weight/BMI status and the fast food and soft drink consumption patterns of participants.

- Lower levels of physical activities and time spent physically active is associated with the overweight or obesity status.

Null Hypothesis: There is no relationship (or a measure of relationship) between body weight/BMI status and the physical activity levels of participants.
Alternative hypothesis: There is a measure of relationship between body weight/BMI status and the physical activity levels of participants.

- Lifestyle and activities such as heavy watching of the television, computer and long sitting time contributes to the risk of overweight or obesity.

  Null Hypothesis: There is no relationship (or a measure of relationship) between body weight/BMI status and the lifestyle of participants.
  Alternative hypothesis: There is a measure of relationship between body weight/BMI status and the lifestyle of participants.

- Respondents' perceptions and beliefs about overweight and obesity have an impact on their weight and BMI status.

  Null Hypothesis: There is no association (or a measure of association) between body weight/BMI status and the perceptions and beliefs about overweight and obesity.
  Alternative hypothesis: There is a measure of association between body weight/BMI status and the perceptions and beliefs about overweight and obesity.

3.10 Ethical approval

The research proposal was written and submitted to the Health Sciences Centre and the College of Education for approval. Ethical approval was then sought from the two institutions: United Arab Emirates University and University of Canterbury.

First (12th January 2011), a letter of research approval at United Arab Emirates University was written to the Provost's Office, UAEU (see Appendix K). This was approved on the 20th of January, 2011. A letter of approval for access to the female hostels was written to the Head of College, Residential College at UAE University, Al Ain, UAE on the 13th January 2011 and was approved on the same day (see Appendix L).

UAEU's Ethics application was completed and submitted, along with the questionnaires (see Appendix E and F), information letters (see Appendix C and D) and consent letters (see Appendix A and B) to the Al Ain Medical District Human Research Ethics Committee for review on the 17th of January, 2011. This committee review required the translation of the advertisement, questionnaire, information letter and consent form into Arabic.

The translations were undertaken by the Medical Research Specialist of the Department of Community Medicine, Faculty of Medicine and Health Sciences, UAEU into the general Quran Arabic. It was double checked by another local citizen of the UAE who is an Assistant Professor of Nutrition of UAE University. On the 13th of March 2011, the Committee approved the research, Al Ain Medical District Human Research Ethics – Protocol No. 11/01 (see Appendix J).

The University of Canterbury Human Ethics Committee was then sent the UC ethics application, UAEU approval letter, and the English and Arabic versions of the questionnaire, information letter, consent form and advertisement on the 31st March, 2011. On April 11th 2011, UC Human Ethics Committee raised a few questions for clarity. This was reviewed and sent back the same day. On the 18th of April, the committee approved the research, Ref: HEC 2011/18 (see Appendix I) and was received on the 20th of April by electronic mail.

3.11 Chapter summary

In this chapter, details of the methods and materials used for the collection of data have been discussed to enable reproducibility of the study. Details of all additional documentation have been attached as appendices. The next chapter presents and describes the results of the survey.

4 Results

The total number of participants in the survey was 321 female UAEU students in the age range of 18-30 years old. This survey uses a purposive (non-probability) sampling method. The study shows that the odds of being overweight or obese increases with age. The likelihood of being overweight and obese was higher among participants who are married, those who are taking medication and those with a family history of obesity. There was a significant association between participants' faculty of study and the prevalence of overweight and obesity (p=0.018). The prevalence of overweight and obesity was also significantly associated with time spent on vigorous activity (p=0.009). The study shows that the odds of being overweight and obese were higher amongst respondents with sedentary lifestyles. The main reason why students want to lose weight was for better health, well-being and because of problem with clothe sizes.

4.1 Participants' social and demographic background

A total of 321 female students participated in the survey out of the 8,087 target population. Some of the participants did not complete all the questions in the questionnaire and this is recorded as 'no response'.

Table 4.1. Demographic characteristics of participants (*N*=321) Al Ain, UAE, 2011

Variable Category	Frequency *n* (%)
Age (years)	
< 20	126 (39.3)
20-24	177 (55.1)
≥25	16 (5.00)
No response	2 (0.60)
Nationality	
United Arab Emirates (UAE)	176 (54.8)
Other Gulf Countries (GCC)[1]	61 (19.0)
Other Arab Countries[2]	47 (14.6)
Others	37 (11.5)
Marital status	
Single	303 (94.4)
Married	17 (5.30)
No response	1 (0.30)

[1]Other GCC countries – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia; [2]Other Arab countries – Algeria, Egypt, Mauritania, Libya, Morocco, Western Sahara, Tunisia, Sudan, Jordan, Lebanon, Syria, Iraq, Yemen

As shown in Table 4.1, despite the diversity of the country of origin, a strong majority of the sample is of Middle Eastern origin with some cultural commonality, a relatively homogeneous sample. Many of the participants were between 20–24 years of age and most of the respondents are United Arab Emirates nationals. As expected given the age group, the majority of the participants are single.

4.1.1 Participants' educational profiles

Participants' faculty and level of education were investigated and reported. The results are shown in Table 4.2.

Table 4.2. Participants' educational profiles (*N*=321) Al Ain, UAE, 2011

Variable Category	Frequency *n* (%)
Faculty of study	
Humanities & Social Sciences	75 (23.5)
Business & Economics	55 (17.2)
Medicine & Health Sciences	44 (13.8)
Science	39 (12.2)
Education	36 (11.3)
Engineering	29 (9.10)
Food & Agriculture	20 (6.30)
Law	14 (4.40)
Information Technology	7 (2.20)
No response	2 (0.60)
Education level	
Foundation studies	136 (42.4)
Bachelors	148 (46.1)
Graduates and higher	34 (10.6)
No response	3 (0.90)

As shown in Table 4.2, the highest percentage of participants was from the faculty of Humanities & Social Sciences. The smallest percentage of participants was from the Faculty of Information Technology. Most of the respondents were either studying towards their bachelors degree or in the foundation studies. A few of the participants were graduates in the process of attaining a postgraduate diploma, a Masters Degree or Doctor of Philosophy.

4.1.2 Parents' education, family history of obesity and medication intake by participants

Questions about parents' educational level, family history of obesity and participants' medication intake were asked. The results are shown in Table 4.3.

Table 4.3. Parents' education, family history of obesity and medication intake of participants

Variable Category	Frequency *n* (%)
Father's education level	
Did not attend	28 (8.70)
Primary	45 (14.0)
Intermediate	50 (15.6)
Secondary	69 (21.5)
University	121 (37.7)
Unknown	7 (2.20)
No response	1 (0.30)
Mother's education level	
Did not attend	46 (14.3)
Primary	58 (18.1)
Intermediate	45 (14.0)
Secondary	86 (26.8)
University	80 (24.9)
Unknown	6 (1.90)
Family history of obesity	
Yes	141 (43.9)
No	177 (55.1)
No response	3 (0.90)
Taking any medication?	
Yes	31 (9.7)
No	288 (89.7)
No response	3 (0.6)

Overall, the education levels of participants' fathers' were generally higher than those of their mothers' (Table 4.3). A high percentage of the respondents have a family history of obesity and the majority were not taking any medication.

4.2 Social and demographic characteristics and BMI status

The social and demographic variables of the participants tabulated against their measured BMI status are presented in Table 4.4. The BMI status were converted to a binary variable for all the cross-tabulation tables; 'Not overweight' include underweight (BMI < 18.50) and normal (BMI = 18.0–24.99)] while 'Overweight' include overweight (BMI ≥ 25.00) and obese (BMI ≥ 30.00).

Table 4.4. Demography variables and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Age in years			
< 20	85 (72.0)	33 (28.0)	0.482
20 – 24	110 (68.3)	51 (31.7)	
≥25	8 (57.1)	6 (42.9)	
Nationality			
United Arab Emirates	110 (67.9)	52 (32.1)	0.450
Other Gulf Countries	37 (64.9)	20 (35.1)	
Other Arab	34 (79.1)	9 (20.9)	
Others	22 (66.7)	11 (33.3)	
Marital Status			
Married	10 (66.7)	5 (33.3)	0.838
Single	193 (69.2)	86 (30.8)	

From Table 4.4, is can be seen that majority of the sample are of Middle Eastern origin which makes it a largely homogeneous group. There was no statistically significant association (p=0.117) between age of respondents and their BMI status. However, the age group ≥25 years had the highest percentage of overweight or obese members while the smallest percentage was the age group <20 years. There was no significant difference between nationality and the BMI status or marital and BMI status. Thirty-two percent of UAE respondents were overweight or obese, while 67.9% were not overweight. Thirty percent of the participants who are single were overweight or obese while 69.2% were not.

4.2.1 Participants' educational profiles and BMI status

The educational profiles of participants are tabulated against their BMI status and presented in Table 4.5.

Table 4.5. Educational profiles and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Faculty of study			
Business & Economics	40 (76.9)	12 (23.1)	
Education	28 (77.8)	8 (22.2)	
Engineering	20 (74.1)	7 (25.9)	
Food & Agriculture	14 (73.7)	5 (26.3)	
Humanities & Social Sciences	44 (63.8)	25 (36.2)	0.018*
Information Technology	5 (83.3)	1 (16.7)	
Law	5 (38.5)	8 (61.5)	
Medicine & Health Sciences	27 (79.4)	7 (20.6)	
Science	19 (50.0)	19 (50.0)	
Education level			
Foundation studies	92 (70.8)	38 (29.2)	
Bachelors	85 (65.4)	45 (34.6)	0.327
Graduates and higher	25 (78.1)	7 (21.9)	

* denotes $p<0.05$

As shown in Table 4.5, there was a significant association between the faculty of study of respondents and their BMI status ($p=0.018$). The highest percentage of overweight or obese participants was found in the Law faculty while the highest percentage of participants who were not overweight were from the Information Technology faculty, followed by those from the Medicine and Health Sciences faculty. The smallest percentage of overweight or obese participants was found in the faculty of Information Technology.

There was no association between education level and BMI status of respondents ($p=0.327$). The highest percentage of overweight and obese was found among participants studying towards their Bachelors degree while the highest percentage of those who were not overweight was found among graduates and higher.

4.2.2 Parents' education, history of obesity, medication intake and BMI status

The participants' parents' educational level, medication intake and history of obesity was tabulated against the BMI status as shown in Table 4.6.

Table 4.6. Parents' education, history of obesity, medication intake and BMI status

Variable Category	Non-overweight *n* (%)	Overweight *n* (%)	*p*-value
Father's education level			0.791
Did not attend school	16 (59.3)	11 (40.7)	
Primary	29 (67.4)	14 (32.6)	
Intermediate	30 (69.8)	13 (30.2)	
Secondary	48 (72.7)	18 (27.3)	
University	75 (69.4)	33 (30.6)	
Mother's education level			0.362
Did not attend	26 (59.1)	18 (40.9)	
Primary	40 (74.1)	14 (25.9)	
Intermediate	32 (78.0)	9 (22.0)	
Secondary	54 (67.5)	26 (32.5)	
University	48 (68.6)	22 (31.4)	
Family history of obesity			0.090
Yes	81 (63.3)	47 (36.7)	
No	119 (72.6)	45 (27.4)	
Taking any medication?			0.344
Yes	17 (60.7)	11 (39.3)	
No	184 (69.4)	81 (30.6)	

Table 4.6 shows there was no association between BMI status and fathers' education level (p=0.791) and mothers' education level (p=0.362). There was no relation between BMI status and participants' family history of obesity (p=0.090) and medication intake (p=0.344) as shown in Table 4.6. The findings show the highest percentage of overweight and obesity is among respondents whose fathers' and mothers' education level is unknown followed by those who did not attend school. A similar percentage of overweight and obesity was found among participants whose father and/or mother did not attend school. The highest percentage of overweight and obese participants was found among those who reported having a family history of obesity while the highest percentage of participants who were not overweight reported no family history of obesity. This indicates that family history of obesity is a risk factor for overweight and obesity.

4.2.3 Binary logistic regression of respondents' age, faculty of study and marital status on BMI status

A binary logistic regression analysis was used to determine the relationship between age, faculty of study and marital status of participants.

Table 4.7. Binary logistic regression of age, faculty of study and marital status on BMI status

Variable Category	OR	(95% CI)
Age in years		
<20	1.00	-
20-24	1.17	(0.69, 1.97)
≥25	1.92	(0.62, 5.98)
Marital Status		
Married	1.00	-
Single	0.90	(0.30, 2.73)
Faculty of study		
Science	1.000	-
Business & Economics	0.300	(0.121, 0.742) ***
Education	0.286	(0.104, 0.785) **
Engineering	0.350	(0.120, 1.021) *
Food & Agriculture	0.357	(0.107, 1.189)
Humanities & Social Sciences	0.568	(0.254, 1.269)
Information Technology	0.200	(0.021, 1.877)
Law	1.600	(0.442, 5.787)
Medicine & Health Sciences	0.259	(0.091, 0.738) **
Family history of obesity		
No	1.000	-
Yes	1.501	(0.911, 2.474)
Taking any medication?		
No	1.000	-
Yes	1.463	(0.645, 3.316)

Levels of significance, *p=0.05, **p<0.05, ***p<0.01
OR; odds ratio, CI; confidence interval

As shown in Table 4.7, participants aged ≥25 years are almost twice (1.92 times) more likely to be overweight or obese compared to those <20 years of age. A trend can be observed in the percentage of overweight with age; as age increases so does the likelihood of being overweight or obese. The odds of a married participant being overweight or obese are slightly higher than that of a single woman. Participants in the faculty of Law are more likely to be overweight or obese compared to those in the Information Technology faculty. Participants who have a family history of obesity are more likely to be overweight or obese, likewise those who are on any form of medication.

4.3 Weight, height, waist circumference and BMI

This section presents details of weight-related variables including self-reported height/weight and measurements of weight, height, waist circumference, BMI calculations as well as self perceived weight status. Table 4.8 reports how respondents assessed their weight status (perceived weight status) by choosing whether they considered themselves underweight, normal, overweight or obese. They also reported their height and weight, and then their self-reported BMI was calculated. The BMI was calculated using the WHO's BMI classification.

Table 4.8. Perceived weight status, self–reported weight status and measured weight status

Variable Category	Frequency *n* (%)
Perceived weight status	
Underweight	34 (10.6)
Normal	180 (56.6)
Overweight	85 (26.5)
Very overweight	19 (5.90)
No response	3 (0.90)
BMI calculated from self–reported height and weight	
Underweight (BMI < 18.50)	36 (11.2)
Normal (BMI = 18.0 – 24.99)	150 (46.7)
Overweight (BMI ≥ 25.00)	46 (14.3)
Obese (BMI ≥ 30.00)	12 (3.70)
No response	77 (24.0)
Assessed BMI calculated from measured height and weight	
Underweight (BMI < 18.50)	64 (19.9)
Normal (BMI = 18.0 – 24.99)	165 (51.4)
Overweight (BMI ≥ 25.00)	65 (20.2)
Obese (BMI ≥ 30.00)	27 (8.40)

As shown in Table 4.8, respondents indicated their perceived weight status and self-reported their height and weight. The assessed BMI was calculated using the height and weight as measured by the investigator. Given the age group, more than half of the respondents were of normal weight. The prevalence of overweight and obesity was 20.2% and 8.40%, respectively. Twenty-four percent of the respondents did not guess or state their height and/or weight. These participants indicated that they did not know their height/weight and they did not want to guess.

4.3.1 Perceived weight status, self-reported and measured BMI status

There was a significant association (p<0.001) between perceived weight and the measured weight/height of participants as well as self-reported weight/height and measured weight/height (Table 4.9). Most of the respondents assessed their weight status correctly.

Table 4.9. Spearman's Rho correlations of perceived weight status, self-reported BMI status and measured BMI status

	Perceived weight status	Self-reported BMI status
Perceived weight		
Self-reported BMI status	.698*	
Measured BMI status	.651*	.784*

* denotes p<0.001

Table 4.9 shows Spearman's (nonparametric) correlation coefficient of perceived weight status, self-reported BMI status and measured BMI status. There were positive correlations between the weight-related variables. The respondents were able to describe and report their height/weight with strong correlations to the actual measured height/weight.

Table 4.10. Statistical comparison of self-reported and actual measurements

	Self-reported weight (kg)	Self-reported height (cm)	Measured weight (kg)	Measured height (cm)	Measured waist circumference (cm)
Mean ± *SD*	57.5 ± 12.5	159 ± 6.27	58.9 ± 13.3	158 ± 6.10	76.6 ± 10.9
Percentiles 25	49.0	155	50	154	69.0
50	56.0	159	57	158	74.5
75	62.7	163	65	163	82.5

SD, Std. Deviation; kg, kilogram; cm, centimetre

As shown in Table 4.10, the mean, lower, middle and upper percentiles show the measure of dispersion for the weight-related data. The average self-reported weight was 57.5kg while the average measured weight was 58.9kg. In addition, the average self-reported height was 159cm while the average measured height was 158cm. The distributions of both self-reported and measured data are narrow and concentrated around the mean. However, the weight measurements are more dispersed.

A Pearson product-moment correlation coefficient (r) was also computed to access the relationship between self-reported and measured height/weight. Pearson's correlation analysis showed there was positive correlations between self-reported weights and measured weights (r=0.983, p<0.01), and between self-reported heights and measured heights (r=

0.891, $p<0.01$). These indicate the respondents were able to describe and report their weight accurately with good correlations.

4.4 Participants' dietary behaviours and food consumption patterns

4.4.1 Participants' breakfast habits

This study reports on the breakfast intake pattern in the thirty days preceding the data collection. Results of the response are indicated in the Table 4.11.

Table 4.11. Dietary habits of participants

Variable Category	Frequency *n* (%)
Breakfast intake in the past 30 days	
Never	30 (9.30)
1-9 times per month	125 (38.9)
10-19 times per month	46 (14.3)
20-29 times per month	37 (11.5)
Always	79 (24.6)
No response	4 (1.20)
Reason for no breakfast intake	
I always eat breakfast	75 (23.4)
Food is not always prepared at home in the morning	6 (1.90)
I am trying to lose weight	5 (1.60)
I cannot eat early in the morning	30 (9.30)
I do not have time for breakfast	151 (47.0)
Not Applicable	27 (8.40)
Some other reason	24 (7.50)
No response	3 (0.90)

The breakfast meal is a very important part of the diet in order to provide the energy to carry out the day's activities, and skipping breakfast can lead to sudden cravings during the rest of the day. Skipping the first meal of the day is therefore considered as an unhealthy behaviour and practice that may influence overweight and obesity status of an individual (Musaiger, 2007). As shown in Table 4.11, participants were asked for the pattern of their breakfast

intake in the thirty days preceding the data collection. Over one-third (38.9%) of respondents had breakfast one to nine times during the thirty days and 9.3% of participants never had breakfast. Approximately one quarter (24.6%) of respondents always had breakfast while 11.5% had breakfast twenty to twenty-nine times in that month. Forty-seven percent indicated that lack of time was the reason for not having breakfast, 9.3% reported that they cannot eat early in the morning and 1.6% of the participants do not eat breakfast because they are trying to lose weight. Almost two percent (1.9%) indicated that food was not always prepared at home in the morning.

4.4.2 Participants' fruit and vegetables intake

Fruit and vegetables in the diet are very important to provide vitamins A, C, and K as well as folic acid and the mineral potassium. Furthermore, fruit and vegetables provide fibre, carbohydrates, and some trace minerals. Vegetables also provide small amounts of protein. In addition to nutrients, fruit and vegetables provide phyto-chemicals (biologically active chemicals that occur naturally in plants), which may help in the prevention of chronic diseases such as obesity, cancer, diabetes and heart diseases.

Table 4.12. Fruit and vegetable consumption patterns of participants

Variable **Category**	**Frequency** ***n* (%)**
Fruit consumption in the past 30 days	
No fruit consumption daily	172 (53.6)
Once daily	95 (29.6)
2 to 3 times daily	35 (10.9)
4 or more times daily	17 (5.30)
No response	2 (0.60)
Vegetable consumption in the past 30 days	
No vegetable consumption daily	64 (19.9)
Once daily	108 (33.6)
2 to 3 times daily	125 (38.9)
4 or more times daily	22 (6.90)
No response	2 (0.60)

As shown in Table 4.12, a majority (53.6%) of the respondents did not eat fruit daily whereas some (29.6%) consumed fruit once daily in the thirty days immediately preceding the survey. Over ten percent (10.9%) of the participants consumed fruits two to three times during the thirty days. On the other hand, 5.3% of the participants consumed fruits four or more times a day during these thirty days. Some (19.9%) of the participants did not consume vegetables daily whereas 33.6% consumed vegetables once daily. Over thirty-eight percent (38.9%) of the respondents consumed vegetables two to three times a day. Only 6.9% of the respondents consumed vegetables four or more times a day during the thirty days.

4.4.3 Participants' 'poor' foods consumption patterns

The consumption of soft drinks, fried fatty foods and fast foods (often prepared by deep frying), is fattening, unhealthy and a major risk factor contributing to overweight and obesity in society.

Table 4.13. 'Poor' foods consumption patterns

Variable Category	Frequency *n* (%)
Soft drink consumption in the past 7 days	
No daily soft drink consumption	195 (60.7)
Once daily	71 (22.1)
2 to 3 times daily	42 (13.1)
4 or more times daily	13 (4.00)
Fast food consumption in the past 7 days	
No fast food consumption in the past 7 days	78 (24.3)
One day	94 (29.3)
2 to 3 days	103 (32.1)
4 or more days	46 (14.6)
Fried fatty foods consumption in the past 30 days	
No daily fried fatty food consumption	83 (25.9)
Once daily	131 (40.8)
2 to 3 times daily	91 (28.3)
4 or more times daily	16 (5.00)

Table 4.13 shows the number of times that students consumed soft drinks (that is, carbonated soft drinks) such as Coke™, Pepsi™, Mirinda™, and Mountain Dew™ and the number of days the participants consumed items from fast food outlets such as KFC™, McDonalds™, Burger King™ and Hardees™ during the seven days immediately before the data collection.

A majority (60.7%) of the respondents did not have soft drinks during the seven days. However, only 24.3% of respondents did not consume fast foods. Of the respondents, 13.1% reported consumption of soft drinks two to three daily during the week. Thirty-two percent (32.1%) of the respondents consumed fast foods two to three times during the week. Four percent of the respondents consumed soft drinks four or more times daily during the week and another 14.6% consumed fast foods four or more days during the week. Most participants consumed fast foods and soft drinks at least once a day during these seven days. In total, 75.7% of the respondents consumed fast foods at least once in the week.

The percentage of participants that did not eat fried fatty food in the thirty days preceding the data collection was 25.9% (Table 4.13). Meanwhile, 40.8% had fried fatty foods once per day in the 30 days with 22.1% having fatty foods twice daily on the average. A total of sixteen individuals (5%) had fried fatty foods four or more times daily during those thirty days. However, this dietary pattern may not likely be the participants' diet pattern throughout their life.

4.4.4 Participants' consumption of dairy products

The patterns of dairy products consumption is shown in Table 4.14.

Table 4.14. Dairy products consumption patterns

Variable Category	Frequency *n* (%)
Dairy products consumption in the past 30 days	
No dairy product consumption	77 (24.0)
Once daily	146 (45.5)
2 to 3 times daily	76 (23.7)
4 or more times daily	22 (6.90)

Table 4.14 shows the pattern of dairy products consumption of the respondents. Twenty four percent of the participants did not consume any dairy product in the thirty days preceding the

data collection. Over forty-five percent of them however consumed dairy products at least once during these thirty days. Meanwhile, 6.9% ate dairy products four or more times in a day during this period of thirty days.

The data in Table 4.14 is difficult to interpret due to the fact that dairy products can either be classified as healthy or unhealthy depending on the type of product, the age of the consumer, allergy status and alternative nutritional source.

4.5 Participants' dietary behaviours and BMI status

A variety of food groups are consumed by the respondents. The tables show the association of respondents' dietary habits with the BMI status of participants.

4.5.1 Participants' breakfast habits and BMI status

Breakfast is a very important meal of the day due to the fact that it gives the energy needed for going about the day's activities. Information on the breakfast habits and its influence on the BMI status of the participants are given in Table 4.15.

Table 4.15. Breakfast habits and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Breakfast intake in the past 30days			
Never	19 (79.2)	5 (20.8)	
1-9 times per month	77 (65.8)	40 (34.2)	
10-19 times per month	29 (65.9)	15 (34.1)	0.817
20-29 times per month	23 (63.9)	13 (36.1)	
Always	51 (72.9)	19 (27.1)	
Reason for no breakfast intake			
Food is not always prepared at home in the morning	4 (80.0)	1 (20.0)	
I always eat breakfast	47 (68.1)	22 (31.9)	
I am trying to lose weight	1 (20.0)	4 (80.0)	
I cannot eat early in the morning	19 (73.1)	7 (26.9)	0.361
I do not have time for breakfast	97 (69.8)	42 (30.2)	
Not applicable	15 (62.5)	9 (37.5)	
Some other reason	17 (70.8)	7 (29.2)	

A common dietary behaviour of the sample of study is skipping breakfast, although, the findings did not show a relationship between BMI status and breakfast intake (p=0.817) and reason for no breakfast intake (p=0.361).

Over twenty percent (20.8%) of the participants who never had breakfast were overweight or obese. Of those who consumed breakfast one to nine times in a month, a high percentage (34.2%) was either overweight or obese while 65.8% of this group were not overweight. Thirty-four percent (34.1%) of overweight or obese participants had breakfast intake for ten-nineteen times. The highest percentage of overweight or obesity was observed among those who reported having breakfast twenty to twenty-nine times per month. Twenty-seven percent (27.1%) of overweight or obese respondents, however, reported 'always' having breakfast.

The main reason for skipping breakfast among overweight or obese participants was lack of time. The majority (80%) of those who skip breakfast because they want to lose weight were either overweight or obese. Meanwhile, the majority (80%) of those who skip breakfast because 'food is not always prepared at home in the morning' were either underweight or normal.

4.5.2 Participants' fruit and vegetable consumption and BMI status

The results of the association between BMI status and the fruit and vegetable consumption patterns are shown in Table 4.16.

Table 4.16. Fruit and vegetable consumption and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Fruit consumption in the past 30 days			
No fruit consumption daily	102 (65.8)	53 (34.2)	0.498
Once daily	67 (74.4)	23 (25.6)	
2 to 3 times daily	19 (61.3)	12 (38.7)	
4 or more times daily	13 (76.5)	4 (23.5)	
Vegetable consumption in the past 30 days			
No vegetable consumption daily	39 (66.1)	20 (33.9)	0.402
Once daily	69 (68.3)	32 (31.7)	
2 to 3 times daily	76 (67.9)	36 (32.1)	
4 or more times daily	17 (81.0)	4 (19.0)	

As shown in Table 4.16, vegetables seem to be consumed at least once per day by most participants. There was no association between the BMI status of participants and fruit (p=0.498) or vegetable (p=0.402) consumption.

Fifty-three percent of overweight or obese participants reported no fruit consumption daily. There is no clear trend in the fruit consumption pattern with the highest number of overweight and obese found among those who did not consume fruits daily while the lowest number is found among those that consumed fruit four or more times daily. Meanwhile the highest percentage (38.7%) of overweight or obese was found among those that reported consumption of fruit two to three times daily and the lowest percentage (23.5%) among participants that reported four or more times consumption of fruit. On the other hand, a very high percentage of participants who consumed fruit four or more times daily were not overweight or obese.

In terms of vegetable consumption, the lowest percentage (19%) of participants who are overweight or obese was found among those that reported consumption of vegetables four or more times daily. Among other groups (consuming no vegetables, once daily or two-three times daily) there were similar percentages of respondents overweight or obese (33.9%, n=20; 31.7%, n=32; 32.1%, n=36) respectively.

4.5.3 Participants' fast food consumption patterns and BMI status

A considerable number of the respondents ate fast foods and/or fried foods at least once daily despite the associated health effects and consequences. Table 4.17 shows the patterns of fast food and fried food consumption in relation to participants' measured BMI status.

As shown in Table 4.17, the relation between fast foods consumption and respondents' BMI status was no significant (p=0.287). However, there was no association found between BMI status and soft drinks (p=0.602), and fried food consumption (p=0.387). The highest percentage (45%) of overweight or obese participants consumed soft drink two to three times daily while the lowest percentage (22.1%) was found for daily consumption. However, 77.9% who were not overweight or obese consumed soft drinks once daily. These types of soft drinks might be diet drinks.

Table 4.17. Fast food consumption and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Soft drink consumption in the past 7 days			
No soft drink consumption daily	120 (68.2)	56 (31.8)	
Once daily	53 (77.9)	15 (22.1)	
2 to 3 times daily	22 (55.0)	18 (45.0)	0.602
4 or more times daily	8 (72.7)	3 (27.3)	
Fast food consumption in the past 7 days			
No fast food consumption in the past 7 days	43 (61.4)	27 (38.6)	
One day	57 (66.3)	29 (33.7)	
2 to 3 days	76 (80.9)	18 (19.1)	0.287
4 or more days	27 (60.0)	18 (40.0)	
Fried food consumption in the past 30 days			
No fried fatty food consumption daily	54 (73.0)	20 (27.0)	
Once daily	83 (68.6)	38 (31.4)	
2 to 3 times daily	55 (65.5)	29 (34.5)	0.387
4 or more times daily	11 (68.8)	5 (31.3)	

For fast food, 40% of the participants who consumed fast food for four or more days during the week were overweight or obese, whereas, 19.1% of the overweight or obese consumed fast food for two to three days. The highest percentage (80.9%) of fast food consumption (two to three days during the week) was found among participants who were not overweight or obese while the least percentage (60%) was for four or more days' consumption.

Table 4.17 shows that 34.5% (highest percentage) of the overweight or obese consumed fried food two to three times daily and 31.4% once daily while the lowest percentage (27%) was found among those that consumed no fried food. The highest percentage (73%) of participants who were not overweight had no fried food and the lowest percentage (65.5%) consumed fried food two to three times daily.

4.5.4 Participants' dairy products consumption patterns and BMI status

In Table 4.18, dairy products consumption was not significantly associated with the BMI status (p=0.366). Dairy products can be beneficial for the body (for the calcium) in bone formation. It also contains fatty acids that could reduce the risk of diabetes. However, dairy

products are a high energy yielding food product that can also be unhealthy when taken in excess.

Table 4.18. Dairy products consumption and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Dairy products consumption in the past 30 days			0.366
No dairy product consumption daily	43 (61.4)	27 (38.6)	
Once daily	98 (71.5)	39 (28.5)	
2 to 3 times daily	48 (71.6)	19 (28.4)	
4 or more times daily	14 (66.7)	7 (33.3)	

As shown in Table 4.18, among those that consumed no dairy products, 38.6% were overweight or obese compared with those who consumed dairy products two-three times per day (28.4%). A total of 61.4% were not overweight or obese who had no dairy products, 71.5% consumed dairy products once daily, 71.6% had dairy products two to three times daily while 66.7% had dairy products four or more times daily.

4.5.5 Binary logistic regression of dietary behaviours on BMI status

The variations in this finding is largely due to the nature of the survey, being a cross-sectional survey, the one-time response may not be their lifetime consumption pattern. Binary logistic regression was also conducted as a further analysis of the variables.

Table 4.19 gives the odds ratios of various dietary behaviours for being overweight or obese. The table shows that participants who consumed fast food two-three days in a week were less likely to be overweight or obese compared to four or more days and this was significant (p=0.003).

Table 4.19. Binary logistic regression of dietary behaviours on BMI status

Variable Category	OR	(95% CI)
Fruit consumption in the past 30 days		
No fruit consumption daily	0.933	(0.231, 3.774)
Once daily	0.688	(0.165, 2.871)
2 to 3 times daily	1.228	(0.261, 5.785)
4 or more times daily	1.000	-
Vegetable consumption in the past 30 days		
No vegetable consumption daily	3.466	(0.764, 15.714)
Once daily	3.809	(0.826, 17.576)
2 to 3 times daily	3.791	(0.158, 16.456)
4 or more times daily	1.000	-
Soft drink consumption in the past 7 days		
No soft drink consumption daily	1.058	(0.206, 5.445)
Once daily	0.701	(0.128, 3.838)
2 to 3 times daily	1.770	(0.334, 9.376)
4 or more times daily	1.000	-
Fast food consumption in the past 7 days		
No fast food consumption in the past 7 days	0.854	(0.362, 2.014)
One day	0.667	(0.289, 1.541)
2 to 3 days	0.260	(0.107, 0.627) *
4 or more days	1.000	-
Fried food consumption in the past 30 days		
No fried food consumption daily	0.736	(0.187, 2.902)
Once daily	0.911	(0.238, 3.491)
2 to 3 times daily	1.184	(0.313, 4.484)
4 or more times daily	1.000	-
Dairy products consumption in the past 30 days		
No dairy product consumption daily	1.130	(0.341, 3.743)
Once daily	0.591	(0.189, 1.846)
2 to 3 times daily	0.679	(0.207, 2.224)
4 or more times daily	1.000	-

Levels of significance, *p<0.05
OR; odds ratio, CI; confidence interval

4.6 Participants' physical activity patterns

In this study, respondents' vigorous physical activity patterns such as heavy lifting, digging, aerobics or fast bicycling were assessed. The moderate physical activities examples include

carrying of light loads, bicycling at a regular pace, or doubles in tennis. The walking pattern was assessed by the number of days that participants walked for at least 10 minutes in the last seven days.

4.6.1 Patterns of vigorous activity

Participants' patterns of vigorous activity are presented in Table 4.20.

Table 4.20. Details of participants' vigorous activity

Variable Category	Frequency *n* (%)
Vigorous activity in the past 7 days	
None	157 (48.9)
1 day per week	70 (21.8)
2 to 3 days per week	60 (18.7)
4 or more days per week	23 (7.20)
Unknown	9 (2.80)
No response	2 (0.60)
Time spent on vigorous activity	
Never	138 (43.0)
Less than 1 hour per day	157 (48.9)
2 to 3 hours per day	8 (2.50)
4 or more hours per day	1 (0.30)
Unknown	14 (4.40)
No response	2 (0.60)
Reason for no vigorous activity	
No time for physical activities	136 (42.4)
Not culturally acceptable	5 (1.60)
Not feminine	28 (8.70)
Other	28 (8.70)
Not Applicable	122 (38.0)
No response	2 (0.60)

As shown in Table 4.20, 48.9% of the participants had done no vigorous activity in the past seven days immediately preceding the data collection. Twenty one percent (21.8%) of the participants however did vigorous activity once during that week and 18.7% were vigorously active for two to three days during the seven days. On the other hand, 7.2% of the respondents performed vigorous activity for four or more days during the week. A large number (43.0%) of respondents did not spend any time in vigorous activity. The most

common reason for reporting no vigorous activity was lack of time followed by 'not feminine'. Some participants also indicated that vigorous activity was not culturally acceptable.

4.6.2 Patterns of moderate activity

Moderate activity patterns are tabulated and presented in Table 4.21.

Table 4.21. Details of participants' moderate activity

Variable Category	Frequency *n* (%)
Moderate activity in the past 7 days	
None	161 (50.2)
1 day per week	66 (20.6)
2 to 3 days per week	53 (16.5)
4 or more days per week	32 (10.0)
Unknown	7 (2.20)
No response	2 (0.60)
Time spent on moderate activity	
Never	116 (36.1)
Less than 1 hour per day	165 (51.4)
2 to 3 hours per day	14 (4.40)
4 or more hours per day	9 (2.80)
Unknown	15 (4.70)
No response	2 (0.60)
Reason for no moderate activity	
No time for physical activities	155 (48.3)
Not culturally acceptable	7 (2.20)
Not feminine	17 (5.30)
Other	30 (9.30)
Not Applicable	110 (34.3)
No response	2 (0.60)

As shown in Table 4.21, about half (50.2%) of the respondents did not participate in moderate activity in the seven days preceding the data collection. Approximately twenty percent (20.6%) performed moderate activity one day per week while 16.5% had two to three

days of moderate activity. Ten percent engaged in moderate activity for four or more days per week. A majority of the participants who were moderately active were engaged in moderate activity for less than an hour. Meanwhile, 4.4% had two to three hours and 2.8% had four or more hours of moderate activity per day. Thirty-six percent (36.1%) of the participants reported not being involved in moderate activity. Over forty-eight percent (48.3%) of the respondents indicated that lack of time was the reason for not being moderately active, 2.2% stated it was culturally unacceptable while 5.3% said it was not feminine. The question was not applicable to 34.3% of the respondents and 9.3% had other reasons for not engaging in moderate activity.

4.6.3 Patterns of daily walking

Participants' patterns of daily walking are presented in Table 4.22.

Table 4.22. Details of participants' daily walking

Variable Category	Frequency *n* (%)
Walking for at least 10 minutes in the past 7 days	
None	13 (4.00)
1 day per week	36 (11.2)
2 to 3 days per week	54 (16.8)
4 or more days per week	210 (65.4)
Unknown	7 (2.20)
No response	1 (0.30)
Time spent walking	
Never	16 (5.00)
Less than 1 hour per day	241 (75.1)
2 to 3 hours per day	33 (10.3)
4 or more hours per day	14 (4.40)
Unknown	14 (4.40)
No response	3 (0.90)
Reason for not walking	
No time for physical activities	46 (14.3)
Not culturally acceptable	7 (2.20)
Not feminine	3 (0.90)
Other	15 (4.70)
Not Applicable	250 (77.9)

As presented in Table 4.22, almost all of the respondents walked for at least 10 minutes in the seven days immediately before the data collection. Four percent of the participants did not walk. Most students (65.4%) walked four or more days per week. However, the majority (75.1%) of the respondents who walked did so for less than one hour. Ten percent (10.3%) walked for two to three hours while 4.4% walked for four or more hours per day. It was also reported that 'no time for physical activity' was the most common reason for not walking.

4.7 Participants' physical activity patterns and BMI status

Cross-tabulations of physical activity patterns of the respondents against the BMI status showed no significant associations. However, it is evident that the study population does not engage in vigorous or moderate physical activities. The only physical activity that most of the participants engaged in was walking for a period of less than one hour a day.

4.7.1 Participants' vigorous activity patterns and BMI status

Patterns of vigorous activity among participants against BMI status are presented in Table 4.23.

Table 4.23. Patterns of vigorous activity and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Vigorous activity in the past 7 days			
None or unknown	109 (72.2)	42 (27.8)	0.250
1 day per week	42 (66.7)	21 (33.3)	
2 to 3 days per week	35 (60.3)	23 (39.7)	
4 or more days per week	15 (71.4)	6 (28.6)	
Reason for no vigorous activity			
No time for physical activities	83 (67.5)	40 (32.5)	0.314
Not culturally acceptable	2 (40.0)	3 (60.0)	
Not feminine	21 (80.8)	5 (19.2)	
Other	15 (60.0)	10 (40.0)	
Not applicable	80 (70.2)	34 (29.8)	
Time spent on vigorous activity			
Never	96 (76.8)	22 (17.6)	0.009*
Less than 1 hour per day	90 (61.6)	56 (38.4)	
2 to 3 hours per day	4 (57.1)	3 (42.9)	
4 or more hours per day	1 (100)	0 (0.00)	
Unknown	10 (71.4)	4 (28.6)	

* denotes $p<0.05$

As shown in Table 4.23, vigorous activity patterns of respondents indicated that quite a number of the participants did not engage in vigorous activity during the seven days preceding the data collection. The BMI status in relation to vigorous activity (p=0.250) and the reason for no vigorous activity (p=0.314) were not significant. However, BMI status was significantly associated with time spent on vigorous activity (p=0.009), a higher proportion of students who are not overweight reported spending no time on vigorous activity than those who were overweight or obese.

Twenty-eight percent (28.7%) of the participants that did no vigorous activity were overweight or obese, a similar percentage to those who reported being vigorously active (28.6%) for four or more days. The reason most often given for not participating in vigorous activity was lack of time. Of those reporting lack of time, 32.5% were overweight or obese compared with 67.5% who were not. Of the participants who did not engage in vigorous activity because of cultural reasons, 60% were overweight or obese with 40% being normal weight or less. Of those reporting no exercise because it was 'not feminine', 19.2% were overweight or obese while 80.8% were not. Most of the participants that engaged in vigorous activity spent less than one hour per day and 38.4% were overweight or obese but 61.6% were not.

4.7.2 Participants' moderate activity patterns and BMI status

Participants' moderate activity patterns are presented in Table 4.24.

Table 4.24. Patterns of moderate activity and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Moderate activity in the past 7 days			
None or unknown	109 (70.3)	46 (29.7)	0.286
1 day per week	44 (72.1)	17 (27.9)	
2 to 3 days per week	30 (61.2)	19 (38.8)	
4 or more days per week	18 (64.3)	10 (35.7)	
Reason for no moderate activity			
No time for physical activities	97 (68.3)	45 (31.7)	0.444
Not culturally acceptable	3 (42.9)	4 (57.1)	
Not feminine	13 (76.5)	4 (23.5)	
Other	21 (77.8)	6 (22.2)	
Not applicable	68 (68.0)	32 (32.0)	
Time spent on moderate activity			
Never	78 (75.0)	26 (25.0)	0.217
Less than 1 hour per day	101 (66.0)	52 (34.0)	
2 to 3 hours per day	8 (66.7)	4 (33.3)	
4 or more hours per day	5 (55.6)	4 (44.4)	
Unknown	10 (66.7)	5 (33.3)	

As shown in Table 4.24, most of the participants do not engage in moderate activity. There was no relationship between moderate activity (p=0.286), reason for no moderate activity (p=0.444) and time spent on moderate activity (p=0.217) and participants' BMI status.

The highest percentage (38.8%) of overweight or obesity was among those who engaged in moderate activity two-three days per week and smallest percentage (27.9%) was among those who engaged in moderate activity one day per week. Of those who were not overweight or obese, 72.1% and 61.2% engaged in one day and two-three days of moderate activity per week, respectively. The most common reason for not engaging in moderate activity was lack of time. Of those reporting a lack of cultural acceptance, 57.1% were overweight and 42.9% were not. A large number of participants were engaged in 'less than one hour per day' of moderate activity; thirty-four percent were overweight or obese but 66% were not overweight.

4.7.3 Participants' walking patterns and BMI status

The walking patterns of participants were tabulated against their BMI status.

Table 4.25. Walking patterns and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Walking for at least 10 minutes in the past 7 days			
None or unknown	11 (61.1)	7 (38.9)	0.348
1 day per week	25 (71.4)	10 (28.6)	
2 or 3 days per week	29 (59.2)	20 (40.8)	
4 or more days per week	137 (71.4)	55 (28.6)	
Reason for not walking			
No time for physical activities	25 (59.5)	17 (40.5)	0.525
Not culturally acceptable	5 (83.3)	1 (16.7)	
Not feminine	2 (66.7)	1 (33.3)	
Other	12 (80.0)	3 (20.0)	
Not applicable	159 (69.4)	70 (30.6)	
Time spent walking			
Never	9 (64.3)	5 (35.7)	0.989
Less than 1 hour per day	151 (68.6)	69 (31.4)	
2 to 3 hours per day	21 (70.0)	9 (30.0)	
4 or more hours per day	9 (64.3)	5 (35.7)	
Unknown	10 (71.4)	4 (28.6)	

As shown in Table 4.25, most of the participants walked for at least ten minutes during the last seven days before the survey for four or more days. Over twenty-eight percent (28.6%) were overweight or obese whereas 71.4% were not overweight. Forty-five percent (45.5%) of those who reported that they did not walk were overweight or obese while 54.5% were not. Of those who reported walking four or more days per week, 28.6% were overweight and obese compared with 71.4% who were not. The majority of the participants did not report lack of time as a reason for not walking because most participants reported walking for at least ten minutes in the past seven days (see Table 4.22).

4.7.4 Binary logistic regression of physical activity patterns on BMI status

Binary logistic regression was computed to give further detailed analysis of the physical activity patterns of the respondents.

Table 4.26. Binary logistic regression of physical activity patterns on BMI status

Variable Category	OR	(95% CI)
Vigorous activity in the past 7 days		
None or unknown	1.000	-
1 day per week	1.423	(0.730, 2.778)
2 to 3 days per week	1.722	(0,859, 3.452)
4 or more days per week	0.954	(0.335, 2.718)
Moderate activity in the past 7 days		
None or unknown	1.000	-
1 day per week	0.785	(0.387, 1.593)
2 to 3 days per week	1.208	(0.583, 2.503)
4 or more days per week	1.431	(0.595, 3.444)
Walking for at least 10 minutes in the past 7 days		
None or unknown	1.000	-
1 day per week	0.678	(0.194, 2.376)
2 or 3 days per week	1.014	(0.322, 3.187)
4 or more days per week	0.561	(0.200, 1.576)

OR; odds ratio, CI; confidence interval

Table 4.26 shows binary logistic regression of BMI status against categorical variables for physical activity and lifestyle. There is no definite pattern or trend found. However, this may be due to the fact that the overweight and obese participants have started to engage in some form of physical activity.

4.8 Lifestyle patterns – TV, computer and idle sitting time

A sedentary lifestyle is a major risk factor for overweight and obesity. It is therefore important to know the lifestyle and pattern of leisure activities of the participants in the study.

Table 4.27. Features of lifestyle patterns

Variable Category	Frequency *n* (%)
Time spent sitting idle on a week day in the past 7 days	
Less than 1 hour per day	44 (15.8)
2 to 3 hours per day	103 (36.9)
4 or more hours per day	132 (47.3)
Time spent on the computer per day	
Less than 1 hour per day	175 (57.9)
2 to 3 hours per day	75 (24.8)
4 or more hours per day	52 (17.2)
Time spent watching TV per day	
Less than 1 hour per day	181 (76.7)
2 to 3 hours per day	34 (14.4)
4 or more hours per day	21 (8.90)

As shown in Table 4.27, 6.5% of the participants watched TV for four or more hours per day while 10.6% watching TV for two-three hours per day. A number (56.4%) of the participants watched TV for less than one hour per day while 25.8% did not watch TV. Sixteen percent (16.2%) used a computer for four or more hours and 23.4% used it for two-three hours. Over forty-one percent (41.1%) of the participants reported that they sat for four or more hours during the seven days preceding the study.

4.9 Participants' lifestyle and BMI status

Sedentary lifestyle is a major cause of overweight and obesity, therefore, the relationship between lifestyle and BMI status was tabulated in Table 4.28.

Table 4.28. Lifestyle of respondents and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Time spent sitting idle on a week day in the past 7 days			0.856
Less than 1 hour per day	29 (72.5)	11 (27.5)	
2 to 3 hours per day	64 (68.1)	30 (31.9)	
4 or more hours per day	79 (65.8)	41 (34.2)	
Time spent on the computer per day			0.184
Less than 1 hour per day	111 (72.1)	43 (27.9)	
2 to 3 hours per day	44 (61.1)	28 (38.9)	
4 or more hours per day	33 (66.0)	17 (34.0)	
Time spent watching TV per day			0.212
Less than 1 hour per day	114 (69.1)	51 (30.9)	
2 to 3 hours per day	20 (62.5)	12 (37.5)	
4 or more hours per day	12 (60.0)	8 (40.0)	

Table 4.28 shows that there was no statistically significant relationship between participants' BMI status and time spent sitting idle (p=0.856), time spent on the computer (p=0.184) and time spent watching TV (p=0.212). Regarding idle sitting time, 34.2% of overweight and obese participants sat idle for four or more hours per day. Forty percent of overweight or obese participants reported watching TV for 4 or more hours per day. There was a steady increase in the TV time and idle sitting time reported by respondents who were overweight or obese.

4.9.1 Binary logistic regression of respondents lifestyle on BMI status

A binary logistic regression was used to determine the odds ratios. As shown in Table 4.29, the longer the period spent on sedentary leisure activities the higher the odds of becoming overweight or obese, especially for time spent sitting idle and watching TV. This indicates a relation between overweight/obesity and sedentary behaviours such as idle sitting and computer and TV watching among the respondents.

Table 4.29. Binary logistic regression of respondents' lifestyle on BMI status

Variable Category	OR	(95% CI)
Time spent sitting idle on a week day in the past 7 days		
Less than 1 hour per day	1.000	-
2 to 3 hours per day	1.236	(0.545, 2.801)
4 or more hours per day	1.368	(0.621, 3.015)
Time spent on the computer per day		
Less than 1 hour per day	1.000	-
2 to 3 hours per day	1.643	(0.910, 2.964)
4 or more hours per day	1.330	(0.672, 2.632)
Time spent watching TV per day		
Less than 1 hour per day	1.000	-
2 to 3 hours per day	1.341	(0.610, 2.950)
4 or more hours per day	1.490	(0.547, 3.867)

OR; odds ratio, CI; confidence interval

4.10 Perceptions and beliefs about overweight and obesity

The beliefs about overweight and obesity could affect attitudes and result in various risk behaviours in individuals. It is therefore necessary to look in detail into the respondents' perceptions and beliefs on the subject of overweight and obesity.

4.10.1 Participants' perceptions of overweight and obesity

Table 4.30 shows the percentage of respondents who wanted to lose weight and their reason for wanting to reduce their weight.

As shown in Table 4.30, thirty seven percent 37.1% did not want to lose weight while 3.70% were not sure. More than half (58.6%) of the participants answered 'yes' to the question: 'Do you want to lose weight?' Furthermore, reasons why respondents want to lose weight were asked and participants were advised of the possibility of choosing more than one answer. The most common reasons for wanting to lose weight were better health (58.5%), appearance (46.8%) and better well-being (26.6%). Participants who wanted to lose weight by exercising to get in better shape was 22.9%, while those who wanted to lose weight so that they could fit into their clothes were 15.4% in total.

Table 4.30. Reasons for weight loss among participants

Variable Category	Frequency *n* (%)
Do you want to lose weight?	
No	119 (37.1)
Not sure	12 (3.70)
Yes	188 (58.6)
No response	2 (0.60)
If yes, why do you want to lose weight?	**n=188**
Lose weight for appearance	
Yes	88 (46.8)
Lose weight for better health	
Yes	110 (58.5)
Lose weight for better well-being	
Yes	50 (26.6)
Lose weight to exercise and get in better shape	
Yes	43 (22.9)
Lose weight because of problems with clothes sizes	
Yes	29 (15.4)

4.10.2 Participants' beliefs about overweight and obesity

People's opinions and acceptable norms tend to influence the way they think and their lifestyle. In this survey, participants' beliefs about obesity prevention, regulation and treatment were reported.

Table 4.31. Beliefs about overweight and obesity

Variable Category	Frequency *n* (%)
Regarding obesity, heredity is	
not at all important	45 (14.0)
only slightly important	74 (23.1)
somewhat important	124 (38.6)
very important	74 (23.1)
No response	4 (1.20)
Obesity may be reduced by diet and exercise	
No	6 (1.90)
Unsure	23 (7.20)
Yes	289 (90.0)
No response	3 (0.90)

As shown in Table 4.31**,** fourteen percent believed that heredity was not at all important, 23.1% believed that it was only slightly important and 38.6% reported that it was somewhat important. However, 23.1% believed it was very important. Most of the participants (90.0%) believed that obesity can be alleviated by diet and exercise. Seven percent (7.2%) were not sure while 1.9% reported that obesity may not be reduced by diet and exercise.

Table 4.32. Beliefs about treatment of overweight and obesity

Variable Category	Frequency *n* (%)
How do you believe obesity may best be treated?	
By hospital, clinics or specialists	55 (17.1)
By general practitioners	42 (13.1)
By dietitians	178 (55.5)
By social workers	24 (7.50)
By individual's effort to change diet and exercise	212 (66.0)
By surgery	20 (6.20)
By prescription medication	6 (1.90)
Others	3 (0.90)

Table 4.32 shows that a substantial number, 66% of respondents believed that obesity may best be treated by the individual's effort to change the diet and exercise regime. In terms of the best way to treat obesity, more than half (55.5%) believed in the dietitian as the best treatment method for combating obesity. The least common treatment option was surgery (6.2%) while a few respondents (0.9%) believed that other kinds of treatment methods are best for treating obesity.

4.11 Perceptions and beliefs about overweight and obesity and BMI status

4.11.1 Participants' perceptions and BMI status

In Table 30, a total of 58.6% (*n*=188) responded in the affirmative to the question; 'Do you want to lose weight?' The awareness, recognition and interpretation of weight and reason for weight loss among participants are shown in Table 4.36.

Table 4.33. Reasons for weight loss and BMI status (*n*=188) Al Ain, UAE, 2011

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Do you want to lose weight?			
Yes	87 (50.0)	87 (50.0)	
Lose weight for appearance			
Yes	47 (57.3)	35 (42.7)	0.095
Lose weight for better health			0.013*
Yes	47 (43.1)	62 (56.9)	
Lose weight for well being			0.001*
Yes	16 (32.7)	33 (67.3)	
Lose weight to exercise and get in better shape			0.463
Yes	26 (60.5)	17 (39.5)	
Lose weight because of problems with clothes sizes			<0.001*
Yes	5 (17.2)	24 (82.8)	

* denotes statistically significant variables

In Table 4.33, weight loss for better health (p=0.013), weight loss for well being (p=0.001) and weight loss because of clothes sizes among participants were associated with their BMI status. However, weight loss for appearance (p=0.095) and weight loss to keep fit (p=0.463) were not significantly associated with participants BMI status. The table shows that 42.7% of overweight or obese participants and 57.3% of those who were not overweight wanted to lose weight for appearance. In terms of better health, 56.9% who were overweight or obese as well as 43.1% who were not overweight wanted to lose weight for better health. For well-being, 67.3% of overweight or obese participants and 32.7% who were not overweight wanted to lose weight for better well-being. Thirty-nine percent (39.5%) of overweight or obese and 60.5% of those who were not overweight wanted to lose weight for fitness and to get in better shape. Eighty-two percent (82.8%) who were overweight or obese wanted to lose weight because of problems with clothes sizes while 17.2% were not overweight.

4.11.2 Participants' beliefs about obesity and BMI status

The beliefs of participants about obesity were cross-tabulated with the BMI status and presented in Table 4.34. Beliefs about obesity and heredity (p=0.078) and obesity and diet and exercise (p=0.463) were not associated with the BMI status.

Table 4.34. Beliefs about obesity and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
Regarding obesity, heredity is			0.078
not at all important	23 (53.5)	20 (46.5)	
only slightly important	45 (67.2)	22 (32.8)	
somewhat important	87 (75.0)	29 (25.0)	
very important	44 (67.7)	21 (32.3)	
Obesity may be reduced by diet and exercise			0.463
No	5 (83.3)	1 (16.7)	
Unsure	13 (59.1)	9 (40.9)	
Yes	182 (68.9)	82 (31.1)	

As shown in Table 4.34, forty-six percent (46.5%) of respondents who reported that heredity was not at all important were overweight or obese while 53.5% were not. Twenty-five percent who were overweight or obese and 75% who were not overweight reported that heredity was somewhat important for obesity. Thirty-two percent (32.3%) were overweight or obese out of those who reported heredity to be very important and 67.7% were not.

The majority of those who reported that diet and exercise may reduce obesity were not overweight; however, 31.1% were overweight or obese.

Table 4.35. Beliefs about obesity treatment and BMI status

Variable Category	Not overweight *n* (%)	Overweight *n* (%)	*p*-value
How do you believe obesity may best be treated?			
By hospital, clinics or specialists			0.465
Yes	38 (73.1)	14 (26.9)	
By general practitioners			0.202
Yes	31 (77.5)	9 (22.5)	
By dieticians			0.643
Yes	114 (69.9)	49 (30.1)	
By social workers			0.253
Yes	19 (79.2)	5 (20.8)	
By individual's effort to change diet and exercise			0.444
Yes	132 (67.3)	64 (32.7)	
By surgery			0.483
Yes	13 (76.5)	4 (23.5)	
By prescription medication			0.909
Yes	4 (66.7)	2 (33.3)	
Others			0.936
Yes	2 (66.7)	1 (33.3)	

As shown in Table 4.35, the variables of treatment by hospital, clinics or specialists (p=0.465), treatment general practitioners (p=0.202), treatment by dieticians (p=0.643), treatment by social workers (p=0.253), treatment by individual effort (p=0.444), treatment by surgery (p=0.483), treatment by prescription medication (p=0.909) and other treatment options (p=0.936) were not statistically significant with the BMI status.

As shown in Table 4.35, most respondents believed in obesity treatment by dietitians and by individual effort to change diet and to exercise. Almost seventy percent (69.9%) who believed in treatment by dietitians as the best option were not overweight while 30.1% were overweight or obese. Sixty-seven percent (67.3%) who believed individual effort is the best treatments for obesity were not overweight while 32.7% were overweight or obese. The majority of the respondents believe that individual effort and treatment by dietitians are the best ways of treating obesity.

4.12 Summary of results and main findings

This thesis in a sample (n=321) of female students of the UAEU aged 18-30 years has shown that:

- Most of the participants were from UAE, single and studying towards a Bachelors degree.
- Participants' BMI status was significantly associated with faculty of study.
- Measured against the WHO classification of overweight and obesity, one in four of the participants were overweight or obese.
- Many of the participants skipped breakfast for various reasons, mainly due to lack of time.
- Some of the participants did not consume fruits and/or vegetables daily and vegetable consumption was more than fruit consumption.
- Three-quarter of the participants consumed fast food at least once daily.
- Most of the participants did not engage in vigorous and/or moderate activities; however, the majority walked at least ten minutes daily.
- Participants' BMI status was significantly associated with time spent on vigorous activity.

- The odds of becoming overweight or obese were found to be higher with longer periods of sedentary leisure activities.
- Perceived weight and self-reported weight status were positively correlated with actual measured weight status.
- Most participants believed that obesity may best be treated by dieticians and/or by individual effort to change diet and exercise patterns.

Overall, the findings of this study provide implications for the population and for health professionals and these will be discussed further in the chapter five that follows.

5 Discussion

5.1 Introduction

This chapter discusses the findings of the study of a sample (*n*=321) of female students of United Arab Emirates University (UAEU) in relation to the three objectives of the study. The first objective of the study was to estimate and describe the prevalence of overweight and obesity among female university students in UAEU. The second objective was to estimate and describe the prevalence of four lifestyle risk behaviours (dietary habits of food consumption, physical activity, sedentary behaviour, and perceptions and beliefs about obesity) of overweight and obesity among female university students in UAEU. The third objective of the study was to examine the relationships between socio-demographic, behavioural and psycho-social lifestyle factors with overweight and obesity. This chapter discusses the findings in relation to these objectives and presents implications, recommendations and directions for future research and education. Finally, a conclusion on the thesis work is made.

5.2 Prevalence of overweight and obesity among female students

The first objective of this thesis was to estimate and describe the prevalence of overweight and obesity among female university students in the United Arab Emirates University (UAEU). Almost twenty percent of the study sample (19.9%) was underweight, 51.4% were of normal weight, 20.2% were overweight and 8.4% were obese (Table 4.4). This finding indicated that more than a quarter of the sample was overweight or obese at the time of study. According to the WHO classification (WHO, 2006), this study shows that the prevalence of overweight within this age group (18-30) is high. Overall, 28.6% were either overweight or obese.

The results of this prevalence study are similar to those of Kerkadi (2003) who found the prevalence of overweight and obesity in female UAEU students aged 18-25 years to be 19.4% and 6.7%, respectively. It is also comparable to the older study by Musaiger & Radwan (1995) who found 19% of female UAEU students to be overweight and 9.8% obese. The current study indicates an increase in the percentage of overweight female students of UAEU. Even though, many of the university students are wealthy, the prevalence of obesity is high. However, the prevalence of obesity in this study is lesser than that of Amine and Samy (1996) who reported that over ten percent (10.8%) of UAEU students were overweight

and 30.6% were obese. That study used the standard weight for height tables issued by the Nutrition Institute in Cairo, Egypt (1966) as a reference value to determine weight status of its sample. This difference in measurements and timing of the study possibly contributed to discrepancies between this and other studies.

The current study showed a positive correlation between perceived weight and measured BMI status as well as between self-reported BMI and measured BMI status. This indicates that respondents have a fairly accurate knowledge of their weight/BMI status. This result is similar to Musaiger's findings that body weight perception was found to be inaccurate in 30% of students with acceptable weight. Eighty percent of those overweight reported themselves as obese (Musaiger, 1993-94).

With respect to knowledge of body weight and height, 24% (*n*=77) did not know their weight and/or their height and the majority did not know their waist circumference. Musaiger (1993-94) also found that 50% of the female university students did not know their height and only 24% knew their weight. From the results of the current study, it is apparent that a higher percentage of students now know their height.

Findings of the weight-related measurements showed that the average measured body weight (58.9 kg) was higher than the average self-reported weight (57.5 kg) while the average measured height (158 cm) was lower than the average self-reported height (159 cm). Furthermore, this analysis showed that some of the participants wrongly perceived their height and weight and thus reported these inaccurately.

However, overall almost a quarter of the participants do not know their height/weight and the majority of the participants did not know their waist circumference.

5.3 Risk behaviours among female students

The second objective was to estimate and describe the prevalence of four lifestyle risk behaviours (dietary habits of food consumption, physical activity, sedentary behaviour, and perceptions and beliefs about obesity) of overweight and obesity among female university students in UAEU.

5.3.1 Dietary behaviours and food consumption patterns

Dietary behaviour and food consumption patterns are important lifestyle factors that influence the health outcome of weight management. The findings showed that over 70% of participants reported skipping breakfast at least once during the thirty days before the data collection. This percentage is higher than that reported by Kerkadi (2003) who found that 44.8% respondents did not have breakfast and 52.3% had only one or two meals per day. A high percentage of overweight and obesity was found among those who consumed breakfast only one-nine times during the thirty days before the survey. Most often, the reason given for not having breakfast was lack of time. This study shows that the majority of the respondents did not prioritise having breakfast when starting their day and may end up consuming fast food and/or bigger meals later in the day (Musaiger, 2007; 2011). A high percentage (53.6%) of the participants reported that they did not consume fruit daily during the thirty days before the data collection. However, for vegetable consumption, a high number (72.5%) consumed vegetables once or two-three times daily. It is notable that the frequency of vegetable consumption was higher than that of fruit consumption in this study. Meals of respondents are therefore likely to contain more vegetable portions than fruit portions.

Many (60.7%) participants reported that they did not consume soft drinks daily during the seven days preceding the data collection. However, a high percentage (76.0%) of the participants consumed fast food at least once daily during the seven days before the data was collected. This result is higher than that of Kerkadi (2003) who found that 34.9% consumed fast food at least once a day. Most (74.1%) of the participants reported the consumption of fried fatty foods at least once daily during the thirty days. Regarding dairy products, the majority of the participants consumed dairy products at least once daily during the thirty days before the data collection. The changing cultural acceptance and globalization of fast food outlets has been linked to worldwide trends in obesity (Prentice & Jebb, 2003). The time difference between the study by Kerkadi (2003) and the present indicate a gap in the surveillance of dietary behaviours that contribute to overweight and obesity in UAE.

5.3.2 Physical activity and lifestyle

Analysis of physical activity patterns showed that the majority of the participants did not engage in any vigorous or moderate activity. The findings showed that 48.9% did not engage

in any vigorous activity during the seven days preceding the data collection and 42.4% reported having no time for physical activities. Over fifty percent (50.2%) reported that they did not engage in moderate activity and 48.3% reported having no time for physical activities. The findings showed that the only physical activity that the majority of the participants engaged in during the previous seven days before the data collection was walking for at least ten minutes. The results also showed that 65.4% walked for at least ten minutes during the seven days preceding the data collection for four or more days per week. However, of those who walked, 75.1% walked for less than one hour. Over fourteen percent (14.3%) reported that they did not have time for physical activities as the reason for not walking, thereby making lack of time the major reason given for not engaging in physical activity. Even though there are few studies on physical activity among this group in UAE, these findings are consistent the few available studies that indicated that the amount of physical activity undertaken by adolescent females in the UAE was very low.

Henry et al. (2004) in a study of students aged 11–16 years, recruited from two female-only government schools in Abu-Dhabi, reported that the physical activity level (PAL) values and daily energy expenditure were considerably lower than those observed in females of a similar age in various countries such as United Kingdom, Sweden, Taiwan, Canada and Australia. Berger & Peerson (2009) also reported in a qualitative study of Muslim college students aged 18-27 years that none of the students had been exercising since primary school and showed no 'noteworthy interest in the topic' at the time of the research. The study also indicated 'lack of: (1) female role models among peers and families, (2) social support, (3) transportation, (4) financial means, (5) time and opportunity, (6) information on the benefits of exercise, and (7) school support' as barriers to physical activity (Berger & Peerson, 2009). This relatively recent study is consistent with the low levels of physical activity reported by UAE students.

For the few who reported performing vigorous and moderate activity, the time spent on this was less than one hour per day. Most often, the reason given for not engaging in vigorous or moderate activity was lack of time for physical activities; this is consistent with reports by Musaiger (2004) on overweight and obesity in the Eastern Mediterranean region and that of Berger & Peerson (2009) which indicated that lack of time was the major contributory factor for an inactive lifestyle. Other reasons given by respondents for lack of physical exercise were that it was not feminine and not culturally acceptable.

Besides the limited level of exercise, quite a number of the respondents spent a considerable amount of time sitting idle, using the computer and watching TV. The findings showed 41.1% spent long hours (four or more hours per day) and 32.1% spent two to three hours per day sitting idle on a week day during the seven days before the data collection. Over sixteen percent (16.2%) of the participants spent long hours (four or more hours per day) on the computer and 6.5% spent a similar amount of time watching TV. These findings show a higher number of hours spent watching TV than reported by Henry et al. (2004) who found that the number of hours per day spent watching television (median and inter-quartile range) was 2.5 (2.3–3.1) in 11–13 year old and 2.5 (2.3–2.8) in 14–16 year old female school adolescents.

5.3.3 Perceptions and beliefs about obesity

More than half (*n*=188) of the participants wanted to lose weight for various reasons (Table 4.33). Most often, the reason for wanting to lose weight was 'for better health' (58.5%) followed by 'for appearance' (46.8%) and then for well-being (26.6%) with respondents indicating multiple reasons. This result is similar to a previous study by Tonstad et al. (2006) among the Norwegians. To the best of the author's knowledge, no survey has previously been undertaken to establish the reasons why young Arab women want to lose weight.

Regarding obesity, respondents' belief in heredity as an important factor was not very strong. However, the majority (90%) of the respondents believed that obesity may be reduced by diet and exercise. This result was similar to that reported by Tonstad et al. (2006). Most of the respondents believed that obesity may best be treated by individual effort (66%), then by dietitians (55.5%). However, the role of medical treatments was not acknowledged by this group of students. Other alternatives, including hospital, clinics and specialists, general practitioners, social workers, surgery and prescription medication were chosen by less than 18% of the respondents. Similarly, in a study of 228 female students of Zayed University, UAE, using the Eating Attitudes Test (EAT) and figure rating scale (FRS), Thomas et al. (2010) reported that 74.8% were not satisfied with their body image.

5.4 Links between lifestyle and overweight/obesity

The third objective was to examine the relationships between socio-demographic, behavioural and psycho-social lifestyle factors and overweight and obesity.

The odds of the participants being overweight or obese were lowest among the age group <20 years and increases with age. This indicates a positive correlation between age and being overweight or obese. This result is similar to that of Carter et al. (2004) who reported that prevalence of obesity was associated positively with age in 535 women in Al Ain, United Arab Emirates. The likelihood of being overweight or obese was higher among participants who were married and have a family history of obesity. The current study found that the prevalence of overweight and obesity was associated with participants' faculty of study (p=0.018). Participants in the faculty of Law, Science and Humanities and Social Sciences were more likely to be overweight or obese than those in the faculty of Information and Technology, Medicine and Health Sciences and Education. This could be that the members of this latter group of faculties are more informed about health than students in other faculties.

The study found that the majority of the participants skipped breakfast, giving lack of time as the reason. However, there was no statistical association between breakfast intake and the prevalence of overweight and obesity.

Even though the consumption of fruit and vegetables was low among the participants, there was no relationship between fruit and vegetable consumption patterns among the participants and being overweight or obese. This is similar to the study by Musaiger and Abuirmeileh (1998) who also reported a low fruit and vegetable consumption pattern in a random sample of men and women in the seven Emirates of UAE. The current study found no statistical association between soft drinks, fried food and dairy food consumption patterns and prevalence of overweight or obesity. Nevertheless, a high percentage of overweight and obese respondents reported a high consumption of soft drinks, fried food and dairy products.

Even though there was no statistically significant association between fast food consumption and overweight and obesity among the participants because of the cross-sectional nature of the study, the high percentages of fast food consumption is an indication of health-risk dietary behaviour among them. Previous studies have reported similar findings regarding the consumption pattern of fast foods. For example, Zaal et al. (2009) found fast foods showed a

significant association with obesity in a national cross-sectional survey of UAE girls aged 12-17 years old (p=0.007). This finding is in accordance with other international studies as reported in the systematic reviews by Rosenheck (2008) as well as Prentice and Jebb (2003) on fast food consumption and obesity in the United States of America and the United Kingdom respectively. Westernization in the UAE has produced many western effects, most notably the greater availability of fast foods that are high in fats, sugar, and carbohydrates. School children are abandoning the Mediterranean-style diet (cereals, vegetables, and fruits) in favour of a largely fast food type of diet (Badran & Laher, 2011).

There was a significant association found between prevalence of overweight/obesity and time spent on vigorous activity (p=0.009). This association might be partly due to higher proportion of overweight/obese participants taking some vigorous exercise or time-sequence issue related to cross-sectional surveys. However, this finding is supported by other studies from the UAE (Berger & Peerson, 2009; Carter et al., 2004; Henry et al., 2004; Musaiger, 1998) who have reported low levels of physical activity in the region. Although there was no association found between prevalence of overweight/obesity and moderate activity and walking patterns of respondents, results from the descriptive frequency table of physical activity patterns of the respondents show that most of the respondents were not involved in any form of vigorous or moderate activity. Many of the respondents walked (four or more days per week) for at least ten minutes, albeit for less than one hour per day. This result is similar to the few studies on physical activities in the UAE which have pointed out the need for more research in this area (Berger & Peerson, 2009; Henry et al., 2004).

The findings of this study suggest that the percentage of overweight and obese respondents increases as the number of hours sitting idle increases. This study is the first to examine the idle sitting time of this population group. Similarly, the percentage of overweight and obese respondents also increased as the number of hours spent using the computer and watching TV increases. This indicates that these forms of inactivity may increase the likelihood of becoming overweight or obese. This is supported by a study by Musaiger et al. (2003) who reported that the risk of obesity was found to be greater among those who watched TV more than four hours a day. Previous studies also indicate that these forms of ‘activities’ are sedentary and constitute a lifestyle that is devoid of an active physical activity (Berger & Peerson, 2009; Henry et al., 2004; Musaiger et al., 2003).

In terms of the relationship between wanting to lose weight for various reasons and prevalence of overweight and obesity, this study found that respondents who wanted to lose weight for better health (p=0.013), for well-being (p=0.001) and because of problems with clothes sizes (p<0.001) were more likely to be overweight or obese. Furthermore, this result indicates that better health, well-being and clothe sizes are the main reasons driving weight loss in this group of students. There was no association between beliefs in treatment and prevalence of overweight or obesity. Similarly, studies have indicated that social factors and body image concerns among females in the UAE are related to disordered eating attitudes and weight status (Eapen et al., 2006; Musaiger, 1994; Thomas et al., 2010; Trainer, 2010)

5.5 Strengths and limitations of the study

5.5.1 Strengths of the study

One strength of this study is that all the data were collected and entered by the same researcher. This gives uniformity, increases the data quality and reduces observer bias and differences. A further strength and novelty of this study is the substantial sample size and variables that were measured to enable proper interpretation of the results and observations. The questionnaire was included adaptations of two questionnaires that have been validated for this population. The questionnaire was very comprehensive and a pilot study was conducted before the start of the actual survey. The study provided important information that would help develop appropriate interventions to tackle obesity in the population of study.

5.5.2 Limitations of the study

The study is, however, limited by its reliance on cross-sectional data (since obesity is a disease that develops over a period of time) resulting in an inability to infer causal relations. This limitation was imposed by the time and financial constraints of a masters thesis. There was also the likelihood that the participants are not a representative of the female population of UAE. Furthermore, the original plan to undertake a random sample was not possible. Invitation letters were sent to randomly sampled names and email addresses. However, there were only three responses from the selected students during a period of two months. A purposive sampling technique was therefore used in the study resulting in low external

validity. Despite this, all the respondents participated in the survey on the basis of the inclusion criteria of age and sex as outlined in the methods chapter of this thesis.

As a result of the method of sampling, the external validity of the study is not strong and results may not be representative of the population. The ability to generalise the findings of this study to other populations is therefore limited due to the fact that the sample was not collected randomly. With respect to the questionnaire, there were some limitations. For the dietary behaviours, the questionnaire asked questions on the number of times of fruit and vegetable consumption instead of the number of servings. The soft drinks consumed might have included diet drinks. Also questions on dairy products consumption were not specific, dairy products can be either beneficial to the body or fattening depending on the consumption patterns and the need for it. The findings were therefore difficult to interpret. Similarly, in the physical activity questions, there was an omission (in the duration of activities) of the timings between one to two and three to four hours. The dietary patterns may not be the participants' diet pattern throughout their life, a problem of cross-sectional studies.

5.6 Implications of the research

Prevalence of overweight and obesity in this study is high at 28.6% among these young adults (18-30 years), indicating that one in four participants is either overweight or obese. This leads to a number of important implications for research and practice by health workers and professionals as well as for policy makers involved in the prevention, education, intervention and regulation of obesity in UAE. From this study as supported by other previous studies, this result is due to the influence of an unhealthy lifestyle and risk behaviours among the population of study.

The results of this study indicate that a high percentage of the respondents engage in health risk behaviours and unhealthy dietary practices that have led to overweight and obesity and could lead to the same in other participants. The significant association of overweight/obesity with the faculty of study and time spent on vigorous activity suggests that knowledge, lack of exercise and risk behaviours of the respondents play a vital role in determining their weight status. Many members of the university students are of high socio-economic status which is associated with the high prevalence of obesity. This finding therefore poses a need for more educational interventions and awareness programs such as preventive counselling and health-

risk screening in educational institutions and communities in order to enlighten the population on the need to change to a healthier lifestyle. The preventive counselling should aim at educating the population on the choice of food and the need to eat healthily while health-risk screening would help early intervention of obesity and related diseases.

This study presented a population that does not prioritise physical activity as an important lifestyle engagement. The low physical activity levels observed was as a result of strong socio-cultural norms attached to sporting activities involvement for women as well as lack of role models and limited accessibility to public exercise venues (Ng et al., 2010). It is therefore important to set up an early intervention to protect this young adult population from developing not only socially and medically negative health outcomes but also health-compromising behaviours that could ultimately lead to morbid obesity in adulthood. This is apparent in the association of overweight/obesity with age and marital status in this study, as participants are more likely to be overweight or obese with an increase in age. The possibility of high profile elite women athletes in UAE presenting themselves as role models for these young adults would encourage them to become active, for example, in sports. The importance of physical activity also needs to be communicated to the students and incorporated as a social activity and if possible into some of the curriculum. This could be achieved for example by setting up, maintaining and sustaining more accessible and culturally acceptable female-only health club facilities. This would create a supportive environment for health and physical activity.

The association of overweight and obesity with weight loss for better health, well-being and clothes sizes in this study indicates that these participants view these as important reasons to lose weight. Therefore, in order to reach out to this population these are important factors that would help in encouraging healthy eating and lifestyle behaviour. Losing weight because of problems with clothing size is closely related to self-image perception and appearance. Although, participants in this study largely perceived their BMI status accurately, self-image is however a major factor that drives weight loss in this population. Educational programs for prevention and managing overweight and obesity therefore need to place an emphasis on the advantages of weight loss in the improvement health and well-being as well as self-image and perceptions in individuals.

In context of the ANGELO framework, accessibility and availability of fast food environments influence obesity. The possibility of fewer fast food outlets and less

advertisement of fast foods might help improve dietary habits. Another factor to consider is the economic and socio-cultural settings of an environment that contributes to overweight and obesity. Increasing the price of fast foods and creating supportive environments for physical activity in an attempt to encourage exercise might yield positive results. For example, street lighting, walking paths, accessible parks and transportation will create a health-promoting environment for the society.

For health professionals and clinicians, it is important to conduct a regular routine check-up for chronic diseases such as obesity, coronary heart disease and type 2 diabetes in hospitals and clinics. This will enable early detection of the various symptoms associated with these diseases. It is also important to have a follow-up plan by social workers to enable proper management of obesity and related diseases as well as any symptom diagnosed.

In terms of the social determinants of health, conditions such as the distribution of money and resources which are influenced by the policy choices of a society play a major role in health (WHO, 2011). Although this research was with an advantaged population, it is important to recognise the needs of the less advantaged. The distribution pattern of labour, economy and resources might influence the rate of inactivity and, consequently, health conditions of a society. Determinants of health in a society such as the social support networks, education and literacy, employment conditions, health services, gender and culture play a key role in shaping the lifestyle in a population.

5.7 Recommendations: research and policy

Obesity is a multi-faceted issue of public health concern: nutrition, genetics, environment, physical activity, culture, and many other factors have an impact on weight-related status of populations. While the focus of this study was on a cross-sectional view of the lifestyle and risk behaviours of the population of study for overweight and obesity, it is recommended that further longitudinal research be undertaken to look into details of the dietary behaviours of this population of study and how it has been affected by acculturation. Studies are also needed to look at specific features of the individuals and the environment that prevent a culture of physical activity in order to develop a sustainable program for an active society and the prevention and management of obesity and obesity-related cardiovascular diseases.

Further research also needs to investigate the beliefs about obesity and the psychological effects of these beliefs on the weight-related status of the population. Future research needs to look more into the specific features of the environment that create a negative influence on dietary habits and physical activity that results in obesity. Income is the most important indicator of SES, the UAE as a high income developing country therefore needs current research to be able establish its overweight and obesity status in relation to SES.

For policy makers, there is a need to consider approaches to reduce the price of fresh fruits and vegetables and make it readily available to the population, as well as possibly reducing or limiting the accessibility and growing number of fast food outlets in the community. A policy to regulate food retailing and consumption by banning the importation of foodstuffs that do not meet the health standards of the WHO is vital as a tool to influence a healthy diet in the population of study. Although the UAE has recently embarked on the move to encourage physical activity in the society, more actions need to be taken in order to change people's beliefs. Policies need to be put in place to reduce car usage in order to encourage walking and usage of the public transportation system. For example, raising the price of cars and making public transportation accessible, building more parks at a walk-able distance and subsidising the membership fee to health clubs would help address some of these issues.

The implementation of health promotion programmes, media campaigns and activities that constitutes culturally acceptable educational seminars and physical activity intervention sessions by service providers and health education professionals could help provide the necessary resources and skills to make healthy lifestyle choices. Canteens and vending machines on campuses need to include healthy meals (with fruits and vegetables) at an affordable price for students.

This study has looked in a preliminary way at some of the possible determinants of overweight and obesity in UAEU female students and it is hoped that it will further stimulate studies on lifestyle influences of overweight and obesity within this population.

6 Conclusion

6.1 The research

This research investigated, estimated and described the prevalence of overweight and obesity and the prevalence of four lifestyle risk behaviours (dietary habits of food consumption, physical activity, sedentary behaviour, and perceptions and beliefs about obesity) of overweight and obesity among female university students in the UAEU. It examined the relationships between socio-demographic, dietary behaviours, physical activity and lifestyle factors and the prevalence of overweight and obesity. Some recommendations were also given for policies, prevention and management of overweight and obesity.

6.2 Health promotion and overweight/obesity

Overweight and obesity within UAE poses an important public health problem. The UAE has embraced Western influences due to its global consumerism culture. Changes in diets, attitudes and lifestyle due to the economic boom and sudden transition have had a profound impact on the health of the people (Thomas et al., 2010). These changes have resulted in greater reliance on convenient fast foods and lack of Mediterranean-style foods (rich in fruit and vegetables). Musaiger (2004) and Zaal (2009) have reported that the improved socio-economic status of many Emirati families has been associated with the rising level of obesity and increased sedentary lifestyle in the UAE. The majority of the university student population belongs to wealthy, high socio-economic status families (Thomas et al., 2010). This might be the reason why a high number of health risk behaviours and high prevalence of overweight and obesity were found among the students.

In terms of the five priority action areas of the Ottawa Charter which includes building healthy public policy, creating supportive environments, strengthening community actions, developing personal skills, and reorienting health services, chronic disease such as obesity is largely a societal endeavour (Sindall, 2001).

It has also been suggested that social determinants studies have pointed out that low socio-economic status, lack of personal control and low levels of social support are major contributors to chronic diseases (Sindall, 2001). It is therefore possible that among lower socio-economic group of similar age there may be even more health-compromising behaviours that need to be checked.

6.3 Previous research

Many studies have indicated the relationship between choice of diets and physical activity habits on the nutritional status of the UAE population (Eapen et al., 2006; Musaiger, 1998; Musaiger, 2002; Musaiger & Radwan, 1995; Musaiger et al., 2000). The current research confirms findings that show a pattern of eating that has moved towards high energy foods, fast foods and fatty foods contributing to weight gain due to lack of exercise. Similarly, this research confirms lack of physical activity with studies also indicating that UAE college women have not developed healthy lifestyles that include regular physical exercise due to various barriers such as lack of female role models, social support, time, transportation, finance, social norms and information on benefits (Ali et al., 2010; Berger & Peerson 2009; Carter et al., 2004; Henry et al., 2004; Musaiger, 1998). According to Amine and Samy (1996), it is unacceptable for females to participate in outdoor sports and exercises. This social norm limits the amount of physical activity undertaken by women in the region. The UAE also features a hot summer during most of the year and mild winter period. Due to the weather, shops are closed between 13:00–16:30 hours and the time is often spent sleeping (Henry et al., 2004).

6.4 Summary

This research provides important additional information to supplement the few studies that described attitudes and body image concerns among females in the UAE (Eapen et al., 2006; Musaiger, 1994; Thomas et al., 2010). These have also been found to be associated with overweight and obesity, especially among college women (Eapen et al., 2006; Musaiger, 1994; Thomas et al., 2010; Trainer, 2010). There is therefore the need for more educational research by health professionals as well as effective interventions on health awareness and education for the population.

This thesis has also highlighted the complexity of the overall environment in relation to risk behaviours associated with overweight and obesity in this population. In the context of the life course model, ANGELO and the social determinants model, this research has identified a number of areas for prevention and intervention in order to induce behavioural changes associated with diet-related non-communicable diseases. Particularly, this thesis has indicated the need for behavioural changes in the area of physical activity.

This study offers a level of insight into the understanding of the patterns of lifestyle that contribute to overweight and obesity among UAEU students. Social ties and social networks to which an individual belong have a great influence on the beliefs and attitudes of the individual. Using data from the Framingham Heart Study, Christakis & Fowler (2007) indicated that having obese social contacts may influence a person's tolerance for being obese or it might affect the behaviours of eating and exercising. This applies to the UAE's strong tribal society as well as schools, colleges and workplaces where social ties of overweight and obesity could be shared.

The role of government in tackling overweight and obesity in UAE cannot be overemphasized. The MOH has started the process and initiated programs for combating obesity, however, it seems to be more focused on treatment services rather than health promotion and educational approaches. Obesity prevention schemes therefore need to be initiated and expanded with an appropriate balance. These need to include food regulations, such as food labelling, which will also involve educating the population on the need to know what they consume and how to read the labels. Physical activity seems to be clearly the big gap with enormous cultural barriers to overcome especially among women. A strategy and means for culturally acceptable exercise facilities and environment therefore needs to be reviewed. Due to the segregation of sexes in a Muslim country such as the UAE, a public health plan and intervention measures for improving physical activity must be set out separately for males and more especially for females.

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Appendix A: Consent form (English)

Telephone number of researcher: 050 1383268
E-mail of researcher: bilesanmi2001@yahoo.com / bli66@uclive.ac.nz
Patient ID number used in the study:

CONSENT FORM

Title of project: Influence of lifestyle choices and risk behaviours for obesity among young adult women in UAE University.

Names of researchers: Bolaji Lilian Ilesanmi-Oyelere
Dr. Ayesha Salem Al Dhaheri
Dr. Syed Mahboobah Shah, Dr. Iain Blair
Dr. Pauline Barnett, Dr. Arindam Basu

1 I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

2 I understand that my participation is voluntary and that I am free to withdraw
3 I understand that if I withdraw from the study it will not adversely affect my healthcare or employment
4 I understand that my data will be kept confidential and in a safe place
5 I agree to take part in the above study

Signature:

_____

Date: _____

Name of researcher: _Bolaji Lilian Ilesanmi-Oyelere_ Signature: _____

Appendix B: Consent form (Arabic)

جامعة الإمارات العربية المتحدة
United Arab Emirates University

UC
UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

رقم هاتف الباحث : 050 1383268
البريد الالكتروني للباحث : bilesanmi2001@yahoo.com/bli66@uclive.ac.nz
رقم المريض المستخدم في الدراسة :

موافقة على المشاركة في الدراسة

عنوان الدراسة:

عنوان المشروع: تأثير خيارات نمط الحياة والسلوكيات المحفوفة بالمخاطر في زيادة الوزن والبدانة بين النساء الشابات البالغات في جامعة الإمارات العربية المتحدة

أسماء الباحثون: بولاجي ليليان إليسانمي أويلير (الباحث الرئيسي)
الدكتور/ عائشة سالم الظاهري
الدكتور/ سيد محبوب شاه
الدكتور/ إيان بلير
الدكتورة/ بولين بارنيت
الدكتور/ أريندام باسو

1. أؤكد أنني قد قمت بقراءة واستيعاب المعلومات الواردة في نشرة "حقائق عن الدراسة" المذكورة أعلاه وقد أتيحت لي الفرصة للإستفسار.
2. إنني أفهم أن مشاركتي في الدراسة طوعية ومن حقي الانسحاب وقتما أشاء.
3. وأفهم أنه في حال انسحابي من الدراسة فسوف لن يؤثر ذلك سلباً في علاجي أو عملي.
4. وأفهم أيضا أن المعلومات الخاصة بي سوف تُعامل بسرية وتُحفظ في مكان أمين.
5. وعلية فأنني أوافق على المشاركة في الدراسة المذكورة أعلاه.

التوقيع:

اسم الباحث: **التوقيع:**

التاريخ:

Appendix C: Information letter (English)

جامعة الإمارات العربية المتحدة
United Arab Emirates University

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

21 February, 2011

INFORMATION SHEET

Study title: Influence of lifestyle choices and risk behaviours for obesity among young adult women in UAE University: A cross-sectional survey

I am a Masters student of Health Sciences in the University of Canterbury, New Zealand. You are being invited to take part in an important research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

The purpose of this study is to know how a way of life that is, choices of food and physical activity as well as cultural beliefs in the society contribute to overweight and obesity. This is important because obesity is the cause of most chronic diseases such as diabetes and cardiovascular diseases. This study will be from Jan-May 2011 and you have been selected randomly from your Faculty to participate in this important study. A total of 321 female students across the UAE University will be invited to participate in this study.

Participation is voluntary, you can withdraw from the study at any time without giving a reason and your declining to participate will not affect you in any way. Your taking part in this study will be kept highly confidential and if required, the results will be communicated to you if you wish.

All information which is collected about you during the course of the research will be kept strictly confidential. You will not be identified in any report or publication. It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect the standard of care you receive.

This research project is being carried out as part of the requirement for a Master's degree in Health Sciences from the University of Canterbury, New Zealand and being funded by the Department of Community Medicine, UAE University under the local supervision of Dr. Syed Mahboobah Shah who can be contacted at syeds@uaeu.ac.ae or +971 3 7137 458.

Dr. Ayesha Salem Al Dhaheri, Director of Studies, Residential College is a co-investigator for this important project. There is no risk at all of taking part; on the other hand, there is the benefit of being part of a study that contributes to the health development of this great country.

If you have any further questions or concerns about the study or your participation in the study please feel free to contact me Bolaji Lilian Ilesanmi-Oyelere at bilesanmi2001@yahoo.com / bli66@uclive.ac.nz or call me at +971 50 138 3268.

Thank you for reading this.

Appendix D: Information letter (Arabic)

جامعة الإمارات العربية المتحدة
United Arab Emirates University

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

21 شباط 2011

استمارة معلومات

عنوان الدراسة: تأثير أنماط الحياة والسلوكيات المحفوفة بالمخاطر في زيادة الوزن والبدانة بين النساء الشابات البالغات في جامعة الإمارات العربية المتحدة

انا طالبة ماجستير علوم صحية في جامعة كانتربيري في نيوزيلندا. انت مدعو للمشاركة في دراسة مهمة. قبل ان تقرر المشاركة او عدمها, من المهم ان تفهم لماذا قررنا اجراء هذه الدراسة وعلى ماذا تحتوي. الرجاء اخذ الوقت الكافي لقراءة المعلومات التالية بدقة ومناقشتها مع الاخرين اذا رغبت بذلك. الرجاء الاستعلام عن اي شيء غير مفهوم او طلب المزيد من المعلومات. خذ الوقت الكافي لتقرر ما اذا كنت تريد الاشتراك بالدراسة ام لا.

الهدف من هذه الدراسة هو معرفة كيف ان انماط الحياة مثل اختيار انواع الطعام و النشاط الجسدي و المعتقدات الاجتماعية تؤدي الى زيادة الوزن والبدانة. هذا مهم لان البدانة هي السبب في معظم الامراض المزمنة مثل السكري و امراض القلب.

مدة الدراسة ستكون من كانون الثاني الى ايار 2011 و انت قد اخترت بشكل عشوائي من الكلية للمشاركة في هذه الدراسة المهمة. سو ف ندعو حوالي 321 طالبة من جامعة الامارات العربية المتحدة للمشاركة في هذه الدراسة.

ان المشاركة طوعية و يمكنك الانسحاب من الدراسة في اي وقت بدون اعطاء اي سبب او بدون ان يؤثر ذلك سلبا عليك. مشاركتك في هذه الدراسة ستكون سرية و اذا رغبت سيكون لك حق الاطلاع على نتائج الدراسة.

جميع المعلومات التي سوف تؤخذ منك خلال الدراسة ستبقى طي الكتمان. لن يعرّف عنك في اي تقرير او منشورة. اذا قررت الاشتراك سوف تعطى لك ورقة المعلومات هذه للاحتفاظ بها و سوف يطلب منك التوقيع على استمارة موافقة. اذا قررت الاشتراك سوف يكون لك كامل الحرية بالانسحاب في اي وقت بدون اعطاء اي سبب. قرارك في الانسحاب او في عدم المشاركة لن يؤثر عليك بأي طريقة.

هذه الدراسة هي جزء من الاشياء المطلوبة للحصول على درجة ماجستير علوم صحية من جامعة كانتربيري في نيوزيلندا وهي ممولة من قسم طب المجتمع في جامعة الامارات العربية المتحدة تحت اشراف الدكتور سيد محبوب شاه :
+971 3 7137 458 syeds@uaeu.ac.ae

الدكتورة عائشة سالم الظاهري, مديرة الدراسات, هي باحث مساعد في هذه الدراسة المهمة. ان المشاركة لا تتضمن اي خطورة لا على العكس سوف يكون هناك استفادة من المشاركة في دراسة تؤدي الى تطور الصحة في هذا البلد العظيم.

اذا كان لديك استفسارات اخرى عن الدراسة او عن المشاركة فيها, الرجاء الاتصال بي: : بولاجي ليليان إليسانمي أويلير
bli66@uclive.ac.nz +971 50 1383268.Bilesanmi2001@yahoo.com

شكرا لقرائتكم هذه الاستمارة.

Appendix E: Questionnaire (English)

جامعة الإمارات العربية المتحدة
United Arab Emirates University

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Lifestyle choices and risk behaviors for obesity questionnaire

Serial # _____ Demography

1. What is your age in years? _____
2. Which college do you belong to? _____
3. What is your subject area of study? _____
4. Current marital status
   1. [ ]Single 2. [ ]Married 3. [ ]Divorced/separated
5. What is your highest level of education?
   1. [ ]Foundation studies (UGRU) 2. [ ]Bachelors 3. [ ]Postgraduate Diploma
      4. [ ]Masters 5. [ ]Others (Please specify) _____
6. What is your nationality?
   1. [ ]UAE
   2. [ ]Other GCC countries
   3. [ ]Other Arab countries
   4. [ ]Other countries (Please specify) _____

7. What is the highest level of schooling your father attained?
   1. [ ]Did not attend school
   2. [ ]Primary school
   3. [ ]Intermediate school
   4. [ ]Secondary school
   5. [ ]University
   6. [ ]Do not know

8. What is the highest level of schooling your mother attained?
   1. [ ]Did not attend school
   2. [ ]Primary school
   3. [ ]Intermediate school
   4. [ ]Secondary school
   5. [ ]University
   6. [ ]Do not know

9. Are you taking any medication?
   1. [ ]No 2. [ ]Yes (Please specify) _____
10. Do you have a family history of overweight and/or obesity?
    1. [ ]No 2. [ ]Yes

Dietary habits

11. During the past 30 days, how often did you eat breakfast?

1. [ ]Never 2. [ ] 1- 9 times/month 3. [ ]10-19times/month
4.[ ] 20-29times/month 5.[ ]Always

12. What is the main reason you do not eat breakfast?

1. [ ]I always eat breakfast
2. [ ]I do not have time for breakfast
3. [ ]I cannot eat early in the morning
4. [ ]Food is not always prepared at home in the morning
5. [ ]There is not always food in my home
6. [ ]I am trying to lose weight
7. [ ]Some other reason

13. During the past 30 days, how many times <u>per day</u> did you **usually** eat fruit, such as apples, oranges, grapes, kiwi, mango, pears, banana, or melons?

1. [ ]I did not eat fruit during the past 30 days
2. [ ]Less than 1 time per day
3. [ ]1 time per day
4. [ ]2 times per day
5. [ ]3 times per day
6. [ ]4 times per day
7. [ ]5 or more times per day

14. During the past 30 days, how many times <u>per day</u> did you **usually** eat vegetables, such as tomatoes, cucumbers, lettuce, or carrots?

1. [ ]I did not eat vegetables during the past 30 days.
2. [ ]Less than 1 time per day
3. [ ]1 time per day
4. [ ]2 times per day
5. [ ]3 times per day
6. [ ]4 times per day
7. [ ]5 or more times per day

15. During the past 30 days, how many times <u>per day</u> did you **usually** drink carbonated soft drinks such as Coke, Pepsi, 7-Up, Mountain Dew, or Mirinda?

1. [ ]I did not drink carbonated soft drinks during the past 30 days
2. [ ]Less than 1 time per day
3. [ ]1 time per day
4. [ ]2 times per day
5. [ ]3 times per day
6. [ ]4 times per day
7. [ ]5 or more times per day

16. During the past 7 days, how many days did you eat at a fast food restaurant, such as McDonalds, Burger King, Pizza Hut, Hardees, Subway, or KFC?

1. [ ] 0 days 2. [ ] 1 day 3. [ ] 2 days 4. [ ]3 days
5. [ ] 4 days 6. [ ] 5 days 7. [ ] 6 days 8. [ ] 7 days

17. During the past 30 days, how many times per day did you **usually** drink milk or eat milk products, such as yoghurt, cheese or labneh?

1. [ ]I did not drink milk or eat milk products during the past 30 days
2. [ ]Less than 1 time per day
3. [ ]1 time per day
4. [ ]2 times per day
5. [ ]3 times per day
6. [ ]4 times per day
7. [ ]5 or more times per day

18. During the past 30 days, how many times per day did you **usually** eat foods high in fat, such as sharwarma, hares, biryani, fried meat, fried potatoes or chips?

1. [ ]I did not eat foods high in fat
2. [ ]Less than 1 time per day
3. [ ]1 time per day
4. [ ]2 times per day
5. [ ]3 times per day
6. [ ]4 times per day
7. [ ]5 or more times per day

Physical Activity

19. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling that makes you breathe faster than normal?

1. [ ]None 2. [ ]1 day per week 3. [ ]2 days per week
4. [ ]3 days per week 5. [ ]4 days per week 6. [ ]5 days per week
7. [ ]6 days per week 8. [ ]7 days per week 9. [ ]Don't know

20. If none, what are the reasons for not engaging in **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

1. [ ]Not culturally acceptable 2. [ ] Not feminine
3. [ ]No time for physical activities 4. [ ] Other (Please specify) _____

21. How much time did you usually spend doing **vigorous** physical activities on one of those days?

1. [ ]Never
2. [ ]Less than 30 minutes per day
3. [ ]Less than 1 hour per day
4. [ ]2 to 3 hours per day
5. [ ]4 to 6 hours per day
6. [ ]7 or more hours per day
7. [ ]Don't know

22. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

1. [ ]None
2. [ ]1 day per week
3. [ ]2 days per week
4. [ ]3 days per week
5. [ ]4 days per week
6. [ ]5 days per week
7. [ ]6 days per week
8. [ ]7 days per week
9. [ ]Don't know

23. If none, what are the reasons for not engaging in **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

1. [ ]Not culturally acceptable
2. [ ] Not feminine
3. [ ]No time for physical activities
4. [ ] Other (Please specify) _____

24. How much time did you usually spend doing **moderate** physical activities on one of those days?

1. [ ]Never
2. [ ]Less than 30 minutes per day
3. [ ]Less than 1 hour per day
4. [ ]2 to 3 hours per day
5. [ ]4 to 6 hours per day
6. [ ]7 or more hours per day
7. [ ]Don't know

25. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

1. [ ]None
2. [ ]1 day per week
3. [ ]2 days per week
4. [ ]3 days per week
5. [ ]4 days per week
6. [ ]5 days per week
7. [ ]6 days per week
8. [ ]7 days per week
9. [ ]Don't know

26. If none, what are the reasons for not **walking** for at least 10 minutes at a time?

1. [ ]Not culturally acceptable
2. [ ] Not feminine
3. [ ]No time for physical activities
4. [ ] Other (Please specify) _____

27. How much time do you usually spend **walking** on one of those days?

1. [ ]Never
2. [ ]Less than 30 minutes per day
3. [ ]Less than 1 hour per day
4. [ ]2 to 3 hours per day
5. [ ]4 to 6 hours per day
6. [ ]7 or more hours per day
7. [ ]Don't know

28. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

1. [ ]Never
2. [ ]Less than 30 minutes per day
3. [ ]Less than 1 hour per day

4. [ ]2 to 3 hours per day
5. [ ]4 to 6 hours per day
6. [ ]7 or more hours per day
7. [ ]Don't know

29. How many hours per day do you usually spend on the computer for email, video games, facebook or twitter?

1) [ ]I do not use video games or the computer
2) [ ]Less than 1 hour per day
3) [ ]1 to 2 hours per day
4) [ ]3 to 4 hours per day
5) [ ]5 to 6 hours per day
6) [ ]7 or more hours per day

30. How many hours per day do you usually watch TV/video movies, or play video games like play station?

1) [ ]I do not watch TV or video movies
2) [ ]Less than 1 hour per day
3) [ ]1 to 2 hours per day
4) [ ]3 to 4 hours per day
5) [ ]5 to 6 hours per day
6) [ ]7 or more hours per day

Perceptions of body weight and beliefs of obesity

31. How would you describe your weight?

1. [ ]Underweight 2. [ ]Normal 3. [ ]Overweight 4. [ ]Very overweight

32. Would you like to lose weight?

1. [ ]Yes 2. [ ]No 3. [ ]Not sure

33. If yes, why would you like to lose weight? (You may choose more than one answer)

1. [ ]For appearance
2. [ ]For better health
3. [ ]For better well-being
4. [ ]Because I want to exercise and get in shape
5. [ ]Problems with clothes and sizes
6. [ ]Other (please specify)_____

34. Regarding obesity, do you believe that heredity is

1. [ ]not at all important 2. [ ]only slightly important
3. [ ]somewhat important 4. [ ] very important

35. Do you believe that obesity can be alleviated by diet and exercise?

1. [ ]No 2. [ ]Unsure 3. [ ]Yes

36. How do you believe that overweight and obesity may be best treated? (You may choose more than one answer)

1. [ ] By hospital, clinics or specialists

2. [ ] By general practitioners
3. [ ] By dietitians
4. [ ] By social workers
5. [ ] By the individual's effort to change diet and exercise habits
6. [ ] Surgery for obesity
7. [ ] By prescription medication
8. [ ] Other

37. Your consent for the measurement of your weight, height and waist circumference is being sought for. Please kindly tick the box below as appropriate. Thanks.

[ ] I would like my weight, height and waist circumference to be measured
[ ] I would not like my weight, height and waist circumference to be measured

38. Please record your weight in kilograms (Kg), height in centimeters (cm) and waist circumference in (cm).

a.	Weight in kilograms (Kg).	
b.	Height in centimeters (cm).	
c.	Waist Circumference (cm).	

To be filled in by investigator.

a.	Weight in kilograms (Kg).	
b.	Height in centimeters (cm).	
c.	Waist Circumference (cm).	

References

International Physical Activity Questionnaire – UNC Gillings School of Global Public Health

Tonstad, S., Anderssen, S., Khoury, J., Ose, L., Reseland, J. & Retterstøl, L. (2006). Weight concerns and beliefs about obesity in the Norwegian population. *Scandinavian Journal of Food and Nutrition. 50* (1), 25 -29.

2005 UAE Global School-based Student Health Survey (GSHS) Questionnaire

Appendix F: Questionnaire (Arabic)

جامعة الإمارات العربية المتحدة
United Arab Emirates University

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

رقم الاستمارة:_____

خيارات نمط الحياة و التصرفات التي تؤدي الى السمنة

معلومات ديمغرافية

1. ما هو عمرك بالسنوات؟_____
2. الى اي كلية تنتمي؟ _____
3. ما هو مجال دراستك؟_____
4. الوضع الاجتماعي الحالي:
   1. اعزب 2. متزوج 3. مطلق/منفصل
5. ما هو مستواك التعليمي؟
   1. دراسات تأسيسية 2. بكالوريوس 3. ديبلوم 4. ماجستير 5. غير ذلك, حدد_____
6. ما هي جنسيتك؟
   1. الامارات
   2. دول خليجية اخرى
   3. دول عربية اخرى
   4. دول اخرى, حدد_____
7. ما هو المستوى التعليمي لوالدك؟
   1. لم يتعلم في مدرسة
   2. مدرسة ابتدائية
   3. مدرسة متوسطة
   4. مدرسة ثانوية
   5. جامعي
   6. لا اعرف
8. ما هو المستوى التعليمي لوالدك؟
   1. لم يتعلم في مدرسة
   2. مدرسة ابتدائية
   3. مدرسة متوسطة
   4. مدرسة ثانوية
   5. جامعي
   6. لا اعرف

9. هل تتناول دواء معين؟
   1. لا 2. نعم, حدد_____
10. هل يعاني احد افراد عائلتك من زيادة الوزن او السمنة؟
   1. لا 2. نعم

العادات الغذائية

11. خلال الثلاثين يوما الماضيين, كم مرة تناولت الفطور؟
   1. ولا مرة 2. 1-9 مرات في الشهر 3. 10-19 مرة في الشهر 4. 20-29 مرة في الشهر 5. دائما

12. ما هو السبب الرئيسي لعدم تناو لك الفطور؟

   1. اتنول الفطور دائما
   2. ليس لدي الوقت لاتناول الفطور
   3. لا استطيع الاكل في الصباح الباكر
   4. لا اجد الطعام محضرا دائما في الصباح
   5. ليس هناك دائما طعام في منزلي
   6. احاول تخفيف وزني
   7. سبب اخر

13. خلال الثلاثين يوما الماضيين, كم مرة خلال اليوم تناولت عادة الفاكهة مثل التفاح, الليمون, العنب, الكيوي, المانجا, الاجاص, الموز, او البطيخ؟
   1. لم اتناول الفاكهة خلال الثلاثين يوما الماضيين
   2. اقل من مرة في اليوم
   3. مرة في اليوم
   4. مرتين في اليوم
   5. ثلاث مرات في اليوم
   6. اربع مرات في اليوم
   7. خمس مرات او اكثر في اليوم

14. خلال الثلاثين يوما الماضيين, كم مرة خلال اليوم تناولت عادة خضار مثل البندورة, الخيار, الخس او الجزر؟

   1. لم اتناول الخضار خلال الثلاثين يوما الماضيين
   2. اقل من مرة في اليوم
   3. مرة في اليوم
   4. مرتين في اليوم
   5. ثلاث مرات في اليوم
   6. اربع مرات في اليوم
   7. خمس مرات او اكثر في اليوم

15. خلال الثلاثين يوما الماضيين, كم مرة خلال اليوم شربت عادة مشروبات غازية مثل الكولا, البيبسي, سفن اب, ماونتن ديو, او ميرندا؟

1. لم اشرب مشروبات غازية خلال الثلاثين يوما الماضيين
2. اقل من مرة في اليوم
3. مرة في اليوم
4. مرتين في اليوم
5. ثلاث مرات في اليوم
6. اربع مرات في اليوم
7. خمس مرات او اكثر في اليوم

16. خلال الايام السبعة الماضية, كم مرة اكلت في مطعم وجبات سريعة مثل الماكدونلد, برجر كنج, بيتزا هات, هارديز, ساب واي او كنتاكي؟

1. ولا يوم
2. يوم
3. يومين
4. ثلاثة ايام
5. اربعة ايام
6. خمسة ايام
7. ستة ايام
8. سبعة ايام

17. خلال الثلاثين يوما الماضيين, كم مرة خلال اليوم شربت عادة الحليب او تناولت مشتقات الحليب مثل اللبن, الجبنة او اللبنة؟

1. لم اشرب حليب او تناولت مشتقاته خلال الثلاثين يوما الماضيين
2. اقل من مرة في اليوم
3. مرة في اليوم
4. مرتين في اليوم
5. ثلاث مرات في اليوم
6. اربع مرات في اليوم
7. خمس مرات او اكثر في اليوم

18. خلال الثلاثين يوما الماضيين, كم مرة خلال اليوم او تناولت اطمعة غنية بالدهن مثل الشاورما,الارانب, بيرياني, لحم مقلي, بطاطا مقلية او شيبس؟

1. لم اتناول اطمعة غنية بالدهن خلال الثلاثين يوما الماضيين
2. اقل من مرة في اليوم
3. مرة في اليوم
4. مرتين في اليوم
5. ثلاث مرات في اليوم
6. اربع مرات في اليوم
7. خمس مرات او اكثر في اليوم

النشاط الجسدي

19. خلال الايام السبعة الماضية, كم يوما قمت خلاله بنشاط جسدي قوي مثل حمل اشياء ثقيلة, حفر, ايروبك, او ركوب الدراجة السريع جعلك تتنفس بسرعة اكبر من العادة؟

1. ولا يوم
2. يوم في الاسبوع
3. يومين في الاسبوع
4. ثلاثة ايام في الاسبوع
5. اربعة ايام في الاسبوع
6. خمسة ايام في الاسبوع
7. ستة ايام في الاسبوع
8. سبعة ايام في الاسبوع
9. لا اعرف

20. اذا كان جوابك ولا يوم, ما هي الاسباب لعدم ممارسة نشاط جسدي قوي مثل حمل اشياء ثقيلة, حفر, ايروبك, او ركوب الدراجة السريع؟

1. ذلك غير مقبول اجتماعيا
2. غير انثوي
3. ليس لدي الوقت
4. غير ذلك, حدد_____

21. كم من الوقت تمضي في ممارسة النشاط الجسدي القوي خلال هذه الايام؟

1. لا اقوم بذلك ابدا
2. اقل من 30 دقيقة في اليوم
3. اقل من ساعة في اليوم
4. ساعتين الى ثلاثث ساعات في اليوم
5. اربع الى ست ساعات في اليوم
6. سبع ساعات او اكثر
7. لا اعرف

22. خلال الايام السبعة الماضية, كم يوما قمت خلاله بنشاط جسدي معتدل مثل حمل اشياء خفيفة, ركوب الدراجة العادي او التنس؟ لا يعتبر المشي جزءا منها

1. ولا يوم
2. يوم في الاسبوع
3. يومين في الاسبوع
4. ثلاثة ايام في الاسبوع
5. اربعة ايام في الاسبوع
6. خمسة ايام في الاسبوع
7. ستة ايام في الاسبوع
8. سبعة ايام في الاسبوع
9. لا اعرف

23. اذا كان جوابك ولا يوم, ما هي الاسباب لعدم ممارسة نشاط جسدي معتدل مثل حمل اشياء خفيفة, ركوب الدراجة العادي او التنس؟ لا يعتبر المشي جزءا منها

1. ذلك غير مقبول اجتماعيا
2. غير انثوي
3. ليس لدي الوقت
4. غير ذلك, حدد_____

24. كم من الوقت تمضي في ممارسة النشاط الجسدي المعتدل خلال هذه الايام؟

1. لا اقوم بذلك ابدا
2. اقل من 30 دقيقة في اليوم
3. اقل من ساعة في اليوم
4. ساعتين الى ثلاث ساعات في اليوم
5. اربع الى ست ساعات في اليوم
6. سبع ساعات او اكثر
7. لا اعرف

25. خلال الايام السبعة الماضية, كم يوما مشيت لمدة عشر دقائق على الاقل دفعة واحدة؟

1. ولا يوم
2. يوم في الاسبوع
3. يومين في الاسبوع
4. ثلاثة ايام في الاسبوع
5. اربعة ايام في الاسبوع
6. خمسة ايام في الاسبوع
7. ستة ايام في الاسبوع
8. سبعة ايام في الاسبوع
9. لا اعرف

26. اذا كان جوابك ولا يوم, ما هي الاسباب لعدم ممارسة المشي لمدة عشر دقائق على الاقل دفعة واحدة؟

1. ذلك غير مقبول اجتماعيا
2. غير انثوي
3. ليس لدي الوقت
4. غير ذلك, حدد_____

27. كم من الوقت تمضي في ممارسة المشي خلال هذه الايام؟

1. لا اقوم بذلك ابدا
2. اقل من 30 دقيقة في اليوم
3. اقل من ساعة في اليوم
4. ساعتين الى ثلالث ساعات في اليوم
5. اربع الى ست ساعات في اليوم
6. سبع ساعات او اكثر
7. لا اعرف

28. خلال الايام السبعة الماضية, كم من الوقت قضيت و انت جالسا خلال اليوم؟

1. ابدا لم اجلس
2. اقل من 30 دقيقة في اليوم
3. اقل من ساعة في اليوم
4. ساعتين الى ثلالث ساعات في اليوم
5. اربع الى ست ساعات في اليوم
6. سبع ساعات او اكثر
7. لا اعرف

29. كم ساعة في اليوم تقضي عادة وانت تستعمل الحاسوب للايميل او الالعاب او فايسبوك او توتير؟

1. لا اقوم بذلك ابدا
2. اقل من ساعة في اليوم
3. ساعة الى ساعتين في اليوم
4. ثلاث الى اربع ساعات في اليوم
5. خمس الى ست ساعات في اليوم
6. سبع ساعات او اكثر

30. كم ساعة في اليوم تقضي عادة وانت تشاهد التلفاز او الافلام او تلعب مستعملا الالعاب الالكترونية مثل البلاي ستايشن؟

1. لا اقوم بذلك ابدا
2. اقل من ساعة في اليوم
3. ساعة الى ساعتين في اليوم
4. ثلاث الى اربع ساعات في اليوم
5. خمس الى ست ساعات في اليوم
6. سبع ساعات او اكثر

نظرة الشخص لوزنه و لمعتقدات السمنة

31. كيف تصف وزنك؟
    1. تحت الوزن الطبيعي
    2. وزن طبيعي
    3. لدي وزن نائد
    4. لدي وزن زائد بشكل ملحوظ

32. هل ترغب بخسارة الوزن؟
    1. نعم
    2. لا
    3. لست متاكد

33. اذا كان جوابك نعم, لماذا تريد ان تخسر وزن؟ (يمكنك اختيار اكثر من اجابة)

    1. للشكل الخارجي
    2. لصحة افضل
    3. لحياة افضل
    4. لاني اريد ان امارس الياضة و اكون بمظهر جيد
    5. لان لدي مشاكل في اختيار الملابس و القياسات
    6. غير ذلك, حدد_____

34. بالنسبة للسمنة, هل تعتقد ان الوراثة
    1. غير مهمة ابدا
    2. مهمة قليلا
    3. مهمة نسبيا
    4. مهمة جدا

35. هل تعتقد ان السمنة يمكن تخفيفها من خلال نظام الاكل و الرياضة؟
    1. لا
    2. لست متاكدا
    3. نعم

36. برايك ما هي الطريقة الافضل لعلاج السمنة والوزن الزائد؟ (يمكنك اختيار اكثر من اجابة)

    1. عن طريق المستشفى, العيادات و الاطباء المختصين
    2. عن طريق اطباء الصحة العامة
    3. عن طريق اخصائيي التغذية
    4. عن طريق العامليين الاجتماعيين
    5. عن طريق المجهود الشخصي للفرد لتتغيير نظام اكله و عاداته الرياضية
    6. عن طريق عمليات جراحية
    7. عن طريق تناول الادوية
    8. غير ذلك

37. نطلب منك الموافقة على اخذ قياساتك (الوزن والطول و محيط الخصر). لطفا ضع علامة على اختيارك.

___ اسمح باخذ قياساتي (الوزن والطول و محيط الخصر)

___لا اسمح باخذ قياساتي (الوزن والطول و محيط الخصر)

38. لطفا سجل وزنك بالكيلوغرام, طولك بالسنتيمتر ومحيط الخصر بالسنتيمتر.

أ	الوزن بالكيلوغرام	
ب	الطول بالسنتيمتر	
ج	ومحيط الخصر بالسنتيمتر	

للتعبئة من قبل الباحث:

أ	الوزن بالكيلوغرام	
ب	الطول بالسنتيمتر	
ج	ومحيط الخصر بالسنتيمتر	

Appendix G: Data collection timetable

Pilot study data collection

Date	**Data collection sites**	**Total number of pilot study data collected**
17th - 21st April, 2011	Faculty of Business and Economics	137

Timetable of main study data collection

Date	**Data collection sites**	**Number of main study data collected**
25th April, 2011	New campus	35
26th April, 2011	New campus	55
1st May, 2011	Maqam 2 Residential College Hostel	73
2nd May, 2011	Maqam 2 Residential College Hostel	38
3rd May, 2011	Maqam 2 Residential College Hostel	15
4th May, 2011	Maqam 2 Residential College Hostel	13
9th May, 2011	Tawam Hostel for females	36
10th May, 2011	Tawam Hostel for females	48
11th May, 2011	Tawam Hostel for females	8
	Total	321

Appendix H: Sample size calculation

The sample size (323) was determined as a function of the population size and it required accuracy at 95% confidence level so that results will be within 5% of the true percentage in the population.

Sample size formula: $n = \frac{Z^2 * (p) * (1-p)}{c^2}$

Where:
Z = Z value (e.g. 1.96 for 95% confidence level)
p = percentage picking a choice, expressed as decimal
(.5 used for sample size needed)
c = confidence interval, expressed as decimal
(e.g., .04 = ±4)

$\frac{1.96^2 * .3 * (1-.3)}{0.05^2} = 322.6944 = \sim 323$

Appendix I: UC ethics approval

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2011/18

18 April 2011

Lilian Ilesanmi-Oyelere
Health Sciences Centre
UNIVERSITY OF
CANTERBURY

Dear Lilian

The Human Ethics Committee advises that your research proposal "Influence of lifestyle choices and risk behaviours for obesity among young adult women in United Arab Emirates University: a cross-sectional survey" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 11 April 2011.

Best wishes for your project.

Yours sincerely

pp LCGriffioen

Dr Michael Grimshaw
Chair, Human Ethics Committee

Appendix J: UAEU ethics approval

UNITED ARAB EMIRATES UNIVERSITY

Faculty of Medicine & Health Sciences

جامعة الإمارات العربية المتحدة

كلية الطب والعلوم الصحية

13 March, 2011

Dr. Bolaji Lilian Ilesanmi-Oyelere
Master of Health Sciences Student
University of Canterbury
New Zealand

Dear Dr. Bolaji,

Re: Al Ain Medical District Human Research Ethics Committee - Protocol No. 11/01 – Lifestyle issues and risk behaviours for obesity among young adult women in United Arab Emirates University: A cross-sectional survey.

Thank you very much for your response to our concerns.

Your submitted documents were reviewed by the committee and I am pleased to provide you ethical approval of your project.

May I reiterate, should there be any ethical concern arising from the study in due course the Committee should be informed.

Annual reports plus a terminal report are necessary and the Committee would appreciate receiving copies of abstracts and publications should they arise.

I wish to take this opportunity to wish you success with this important study.

With kind regards,

Yours sincerely,

Dr. Fawaz C. Torab,
Chair, Al Ain Medical District Human Research Ethics Committee
/S3

Appendix K: UAEU Provost approval letter

UAEU Faculty of Medicine and Health Sciences

جامعة الإمارات العربية المتحدة
United Arab Emirates University

UAEU Office of the Provost
Incoming Mail: 9/2011
Date: 21/1/2011

Lilian B. Ilesanmi-Oyelere
Department of Community Medicine
Faculty of Medicine and Health Sciences
United Arab Emirates University
12th January, 2011

Office of the Provost

United Arab Emirates University

Dear Sir,

APPROVAL OF RESEARCH AT UAE UNIVERSITY

I am Lilian Bolaji Ilesanmi-Oyelere, a Masters student from the Health Sciences Centre at the University of Canterbury, Christchurch, New Zealand. In partial fulfillment of my M.Sc. study, I intend to carry out a research on the lifestyle issues and health risk behaviours that contribute to obesity among female students of UAE University. The study has been approved by the Dean of the Faculty of Medicine and Health Sciences. The research will take place under the local supervision of Dr. Syed Mahboobah Shah and Dr. Iain Blair of the Department of Community Medicine, FMHS and Dr. Ayesha Al Dhaheri, Director of Studies, Residential College as co-investigator. I also have Dr. Pauline Barnett and Dr. Arindam Basu of the Health Sciences Centre, University Of Canterbury as my academic supervisors.

The objectives of my research are:

- to inquire into the patterns of health behavior and cultural lifestyle factors among female students of UAE University that create conditions for overweight and obesity.
- to examine the relationships between lifestyle issues, risk behaviours and obesity among female students.
- to examine perceptions of obesity among students and their knowledge of the consequences of obesity and being obese.

The data collection will take place in the students' residential hostels. The students will be required to fill in a questionnaire. Weight, height and waist circumference of consenting students will also be measured.

I have attached a copy of the questionnaire and any additional details will be sent if required. I hope that this research is favourably considered and look forward to hearing from you.

Kind regards,

Lilian Ilesanmi-Oyelere

Department of Community Medicine, Faculty of Medicine & Health Sciences, UNITED ARAB EMIRATES UNIVERSITY

Prof. Tar-Ching Aw
Chair, Community Medicine Department

Dr. Ayesha Al Dhaheri
Dr. Iain (Medecine)
Dr. Syed (Medicine)

noted & approved
Provost
20.1.11

Appendix L: Access to female hostels

Lilian Bolaji Ilesanmi-Oyelere

Department of Community Medicine

Faculty of Medicine and Health Sciences

UAE University, Al Ain, UAE

13th January, 2011

Head of College,

Residential College,

UAE University

Dear Dr. Ayesha,

APPROVAL FOR ACCESS TO THE FEMALE STUDENTS' HOSTEL

As a requirement for the partial fulfilment of Masters of Health Sciences from the Health Sciences Centre in the University of Canterbury, Christchurch, New Zealand, I intend to carry out a study on the lifestyle issues and risk behaviours that contribute to the risk of overweight and obesity among young female adults of UAE University. This study has been approved by the Dean of Faculty of Medicine and Health Sciences.

The total number of students required to participate are 500 female students proportionately sampled from all the Faculties. The study will involve the filling-in of lifestyle issues and risk behaviours questionnaire and measurement of the weight, height and waist circumference of students with their consent. The duration of the data collection will be from January, 2011 to May, 2011. This study will receive ethical approval and permission from the Provost of UAE University. If required, further information will be provided.

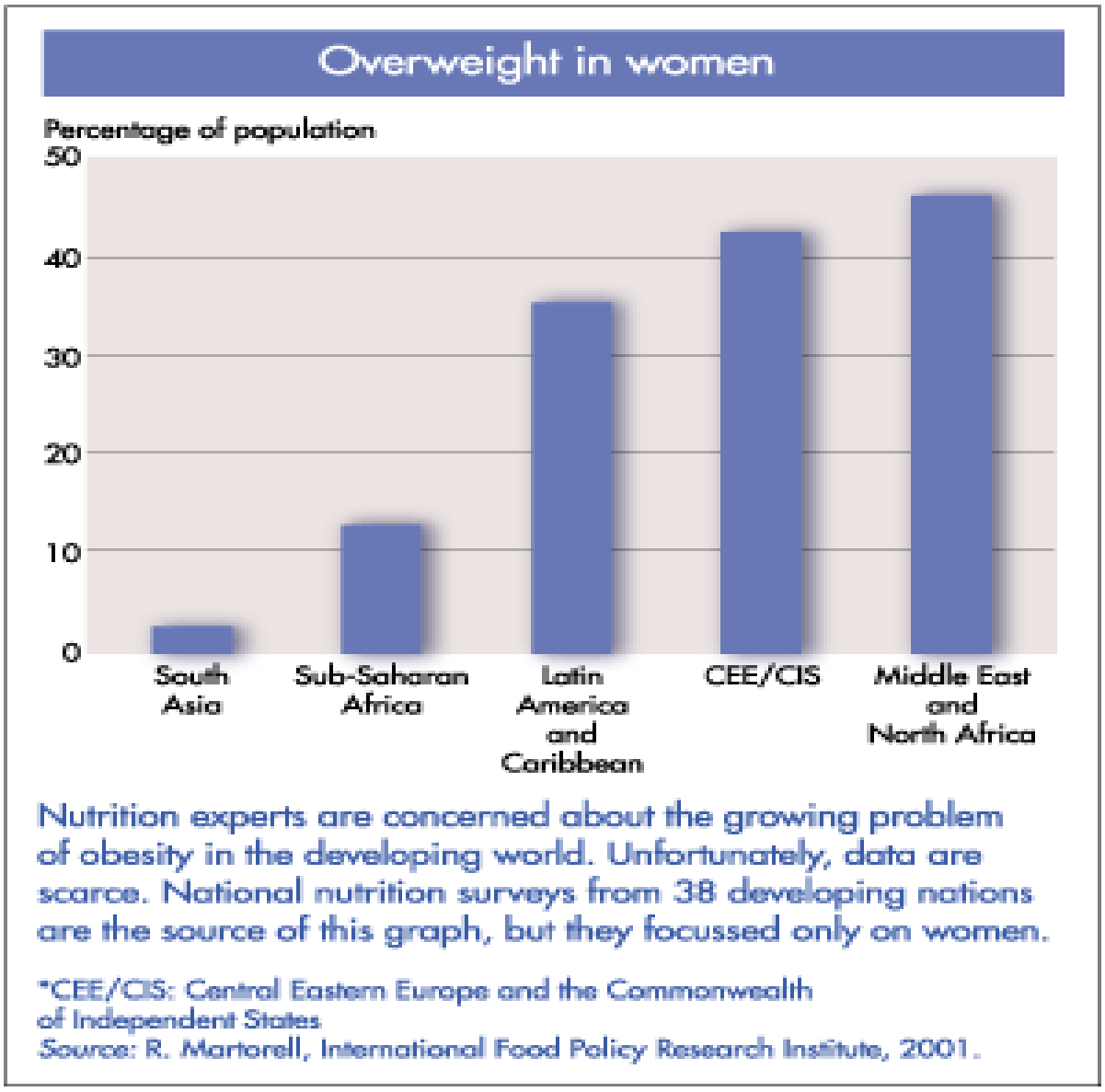
Kind regards,

Lilian B. Ilesanmi-Oyelere

Dr. Ayesha Salem Al Dhaheri

Head of College, Residential College

Appendix M: 'The developing world's new burden: Obesity.'(International Obesity Taskforce., 2002)



Appendix N: Advertisement in English language

A research on lifestyle and obesity among female students of the UAEU. Letters of invitations will be sent out. You are cordially invited to participate. Thank you.

Any further questions, please call the investigator Lilian Ilesanmi-Oyelere
050 138 3268

Appendix O: Advertisement in Arabic language

بحث عن نوعية الحياة والسمنة لدى
طالبات جامعة الامارات العربية
المتحدة. انتن مدعوات للمشاركة في هذه
الدراسة .سنرسل اليكن دعوات
للمشاركة.

شكرا

اذا كانت لديكن اسئلة, الرجاء الاتصال
بالباحثة: ليليان إليسانمي أويلير

050 138 3268

E-mail:
bilesanmi2001@yahoo.com
/bli66@uclive.ac.nz